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SOCIAL STUDIES

INDIA AND THE WORLD

BOOK 3

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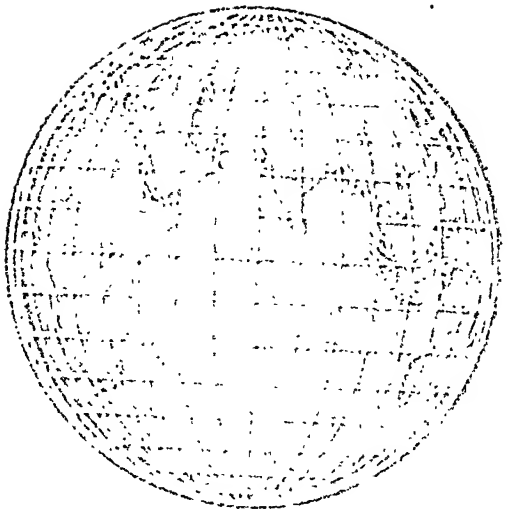


OUR EARTH

DO you know that you are moving while you read this book ? Even if you are sitting on the ground while you read, you are moving at great speed. In fact, you are travelling faster than most modern airplanes. You are even travelling faster than the world's fastest rocket or space ship. And what is even more difficult to believe, you are travelling in more than one direction. The fact is that the earth we live on is moving continuously.

There are many other things about the earth that are unusual and interesting. In the chapters that follow, you can learn many things about the earth. Even more important than the facts you can learn, will be your chance to learn how to use globes and maps. The colour, lines and other symbols used on globes and maps provide much information. They can help you to discover a great deal about continents and oceans ; hot regions and cold regions; wet areas and dry areas ; regions of dense population and regions of sparse population.

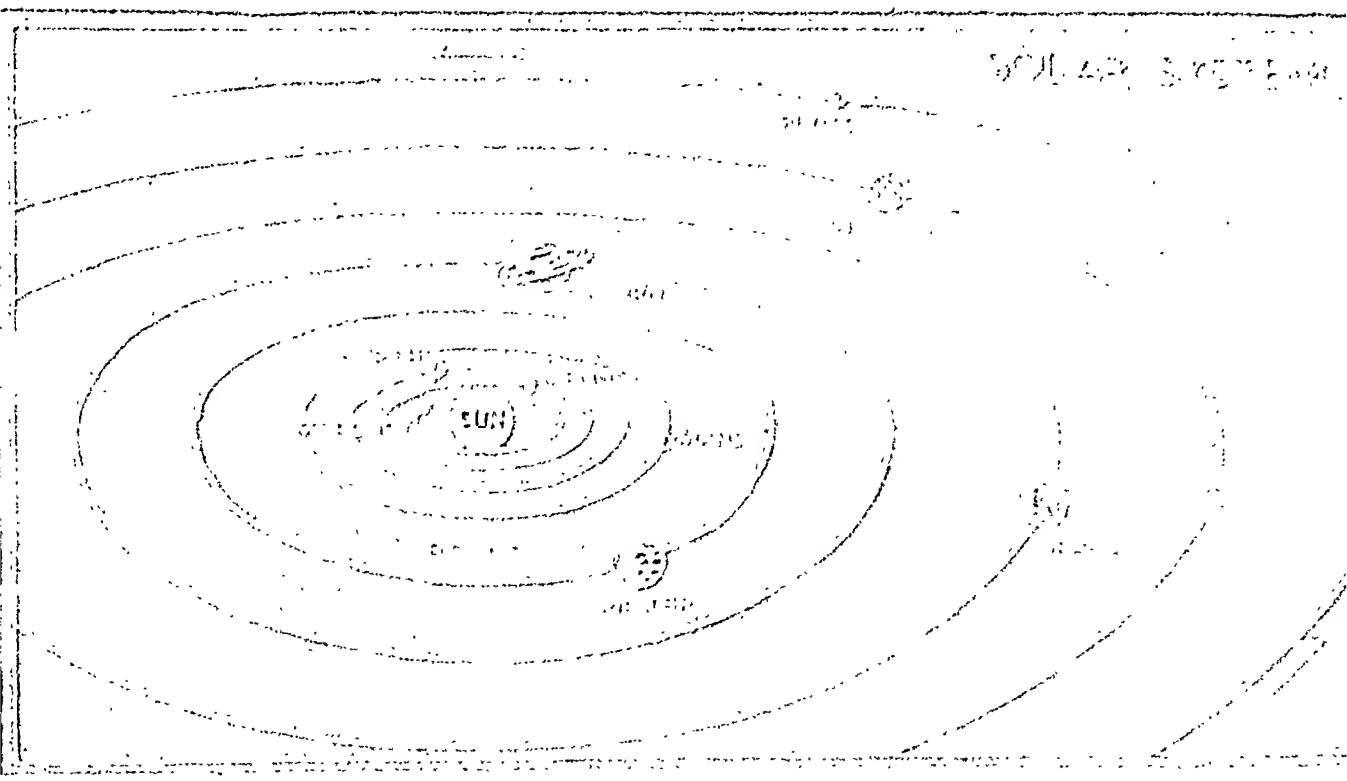


Fig. 1

1 The Earth and the Sun

Solar System

Our earth is just one of a number of objects circling around a star that we call our sun. All of these objects and the sun are called the **solar system.** The earth is one of the important objects in this system. You will note from Figure 1 that the earth is one of the nine **planets** circling around the sun. Planets are those objects which travel around the sun and receive their light and heat from it ; unlike the sun they do not have light and heat of their own.

Each planet has its satellite. Satellites are objects which move round their planet and, like the planets, receive their light and heat from the sun. The moon, for example, is a satellite of our planet earth. Some planets have more than one satellite.

Study Figure 1 and see if you can tell which is the biggest planet and which is the smallest. You will note that the earth is neither the biggest nor the smallest planet in the solar system. The largest planet is Jupiter

which is more than a thousand times larger than the earth. The smallest planet is Mercury. Our earth is very small in comparison with the sun. If we imagine the sun as a ten centimetre circle, we would have to imagine the earth as a tiny ball no bigger than a pinhead.

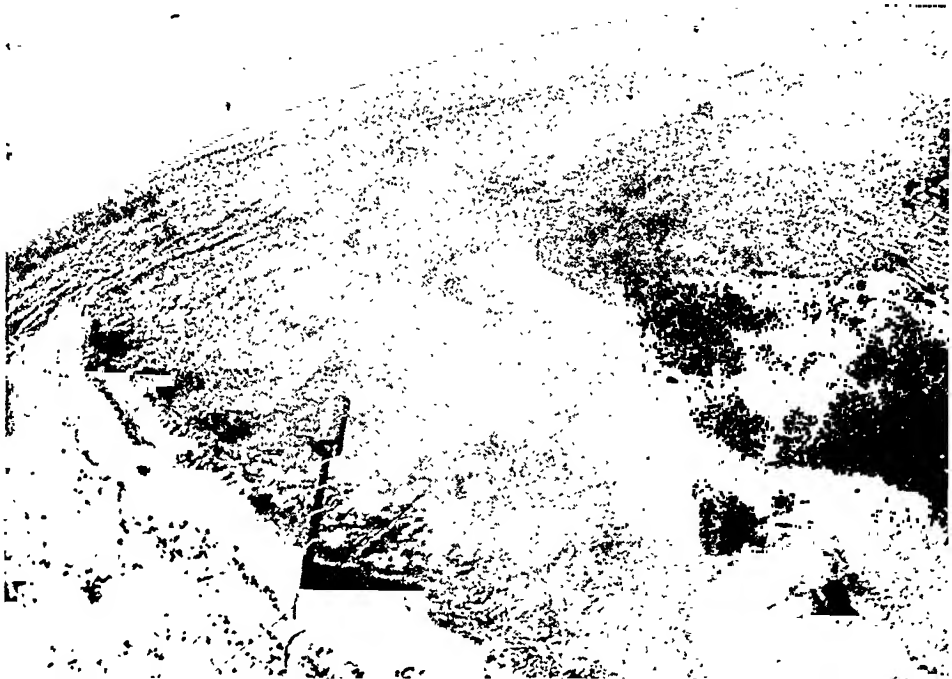
Mercury makes a complete turn round the sun in just 88 days while Pluto does it in serveral years. Different planets take different times to circle round the sun. The difference in time is due to the variation in the length of the paths along which they go round the sun. Also the speed of each planet differs.

Study Figure 1 again and see the shape of the earth's path as it travels round the sun. It is **eliptical.** That is, it is not a true circle and the earth's distance from the sun varies with its position on the path. Sometimes it comes nearer the sun and sometimes it goes farther away from it.

Shape of the Earth

In olden days people used to think that the earth was flat. After some time they thought it was round like a ball. Even now, when you try to draw the earth on a piece of paper, it looks like a circle. Actually, scientists have found that it is not a perfect sphere. Its real shape is like an orange. Its surface is slightly flat at the North and South Poles, which are the two opposite points on it. You will learn more about these poles in the next chapter.

The earth is our home. We live on its surface. The outside face of the earth is called the earth's surface. The earth's surface satisfies most of



This photograph shows the spherical shape of the earth. It was taken from 850 kilometres above the earth. You can see parts of India and Sri Lanka in the picture.

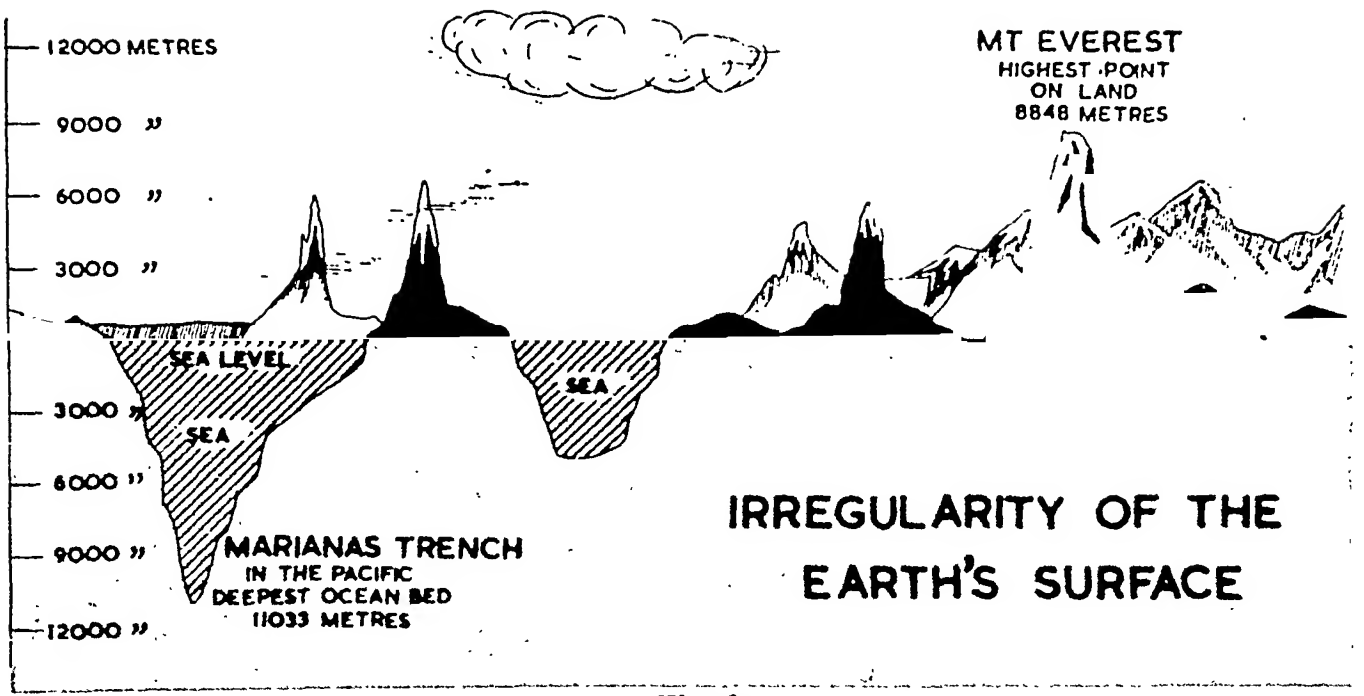


Fig. 2

our needs. All our needs, such as food, clothing and shelter depend on the surface of the earth. Therefore the study of the earth's surface is very important for us.

From Figure 2 you can see that the surface of the earth is not smooth and that it is not the same everywhere. It is high at some places, low at others. Some of it, as much as 11000 metres, is under water. Some of it, as you already know, is over 8000 metres above sea level.

Most of the very low portions of the earth's surface are covered with water. These vast areas of water are called **sea** or **ocean.** The portions of the earth's surface that are above the level of sea water are called **land.** In fact, there is so much water on the earth's surface that if we could take all the land which is now above water and dump it into the oceans, it would not fill these up. About three-fourths of the earth's surface is covered by water.

The whole land area of the earth's surface is divided into several **continents.** Continents are the larger, unbroken masses of land. Read the names of different continents in Figure 9. Similarly there are several oceans on the earth's surface. Read the names of different oceans in the same figure.

You must have observed in Figure 9 that all the oceans of the world are connected with one another. There-

fore the level of sea water remains the same everywhere. This level of sea water is called **sea level.** We measure the height of land or the depth of the ocean from sea level. From Figure 2 can you find the name of that portion of the earth's surface which is more than 8000 metres above sea level ?

Changes in the Earth's Surface

The earth's surface is always changing ; it is very different from what it was millions of years ago What is now covered by water, many years ago would have been hundreds of metres above the ocean. Sea shells and fossils which were once under water are now found on very high land. Near the tops of the Himalayas, the highest peaks in the world, people have found the kinds of rocks formed by matter which settled at the bottom of a sea. This can mean only that the tops of the Himalayas were once at the bottom of the sea.

There are many things which work to change the earth's surface. You know that water carries away soil and wears down rocks. The Ganga, for example, brings huge quantities of earth to our plains from the Himalayas. When water freezes it can split rocks. Winds blow loose sand and dirt. This can build up **sand-dunes** or hills of sand in deserts. It can also, over many, many years, smooth off sharp mountain peaks. Sometimes a part of the earth's surface rises gradually, or sometimes it goes down slowly.

This goes on most of the time. But the change in the earth's surface is so slow that we fail to notice it. It would take many hundreds or thousands of years to notice the change.

Sometimes the change in the earth's surface is sudden or very quick. This happens when there is an **earthquake** in any part of the earth. We call the trembling of the earth an earthquake. Sometimes during an earth-

Compare the shape of the volcano in this picture with that of an ice cream cone. See the smoke coming out of the top of the volcano.

quake the earth's surface splits and shifts. The hot gases and melted rocks are able to escape through such cracks in the earth's surface. This hot melted rock is called **lava.** It spreads over the land, often forming a hill with an opening at its centre. The hot lava flows from this hole, down the hill-side and covers the surrounding land. This hill with an opening through which the hot lava flows is called a **volcano.** These things help to change the earth's surface very quickly.

Questions to answer

1 *What is the solar system ?*

2 *Study Figure 1 and answer the following questions :*
   (*a*) *Which planet is the closest to the sun ?*
   (*b*) *Which planet is the farthest from the sun ?*
   (*c*) *Which planet would have the hottest day ?*
   (*d*) *Which planet would have the coldest day ?*
   (*e*) *What other things besides planets are part of the solar system ?*

3 *Study Figure 1 again and prepare a list of all the planets of the solar system.*

4 *How do you say that the earth's surface is not the same everywhere ?*

5 *What are some of the ways in which the earth's surface is changed gradually ?*

6 *What are some of the ways in which the earth's surface is changed suddenly ?*

7 *How do we know that the Himalayas were once under water ?*

Things to do

1 *Prepare a model of the solar system with papier mache.*

2 *Find out the height above sea level of the place where you live.*

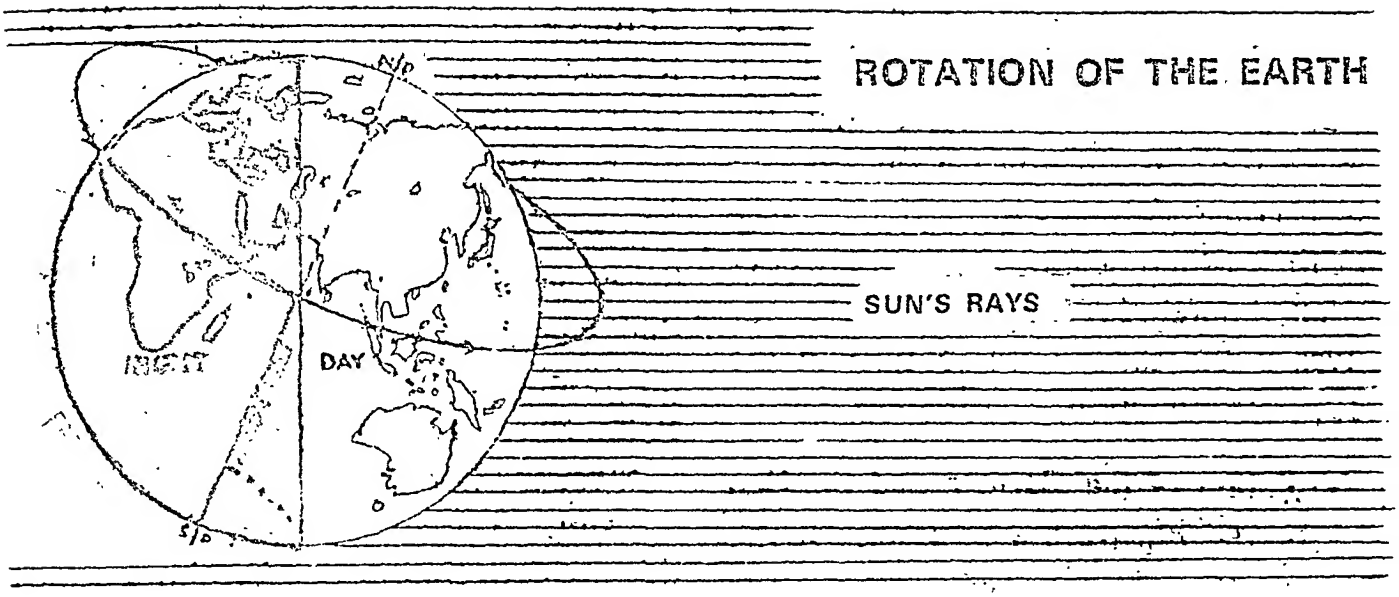


Fig. 3

2 Motions of the Earth

Rotation of the Earth on its Axis

Look at the illustration in Figure 3. The arrow round the earth shows that the earth is turning. Actually it spins like a top on an imaginary rod running through its centre. We call the places where this imaginary rod sticks out, the **North Pole** and the **South Pole.** And the imaginary rod itself is called the earth's **axis.** On this axis the earth continually turns round and this motion of the earth is called **rotation.**

Formation of Day and Night

While rotating on its axis the earth makes one complete turn in every twenty-four hours. This duration of time is called a day. This is the reason why rotation of the earth is also called **daily motion.** Day and night are caused as a result of the earth's rotation on its axis. The side of the earth which faces the sun has day and the side which is turned away from the sun has night. Our earth receives light and heat from the sun. If the earth did not rotate, one-half of it would be in continuous darkness. The other half would have continuous daylight. It is interesting to consider what would happen if this were true !

Besides learning that the earth rotates on its axis, people many years ago also learned of the direction in which it rotated. Each morning they would note that the sun appeared on

the eastern horizon and disappeared in the direction that we call west. It was quite clear, therefore, that the earth was turning toward the east, or in a counter-clockwise motion. Once again it would be interesting to consider what differences it would make in our lives if the earth were to turn in the opposite direction !

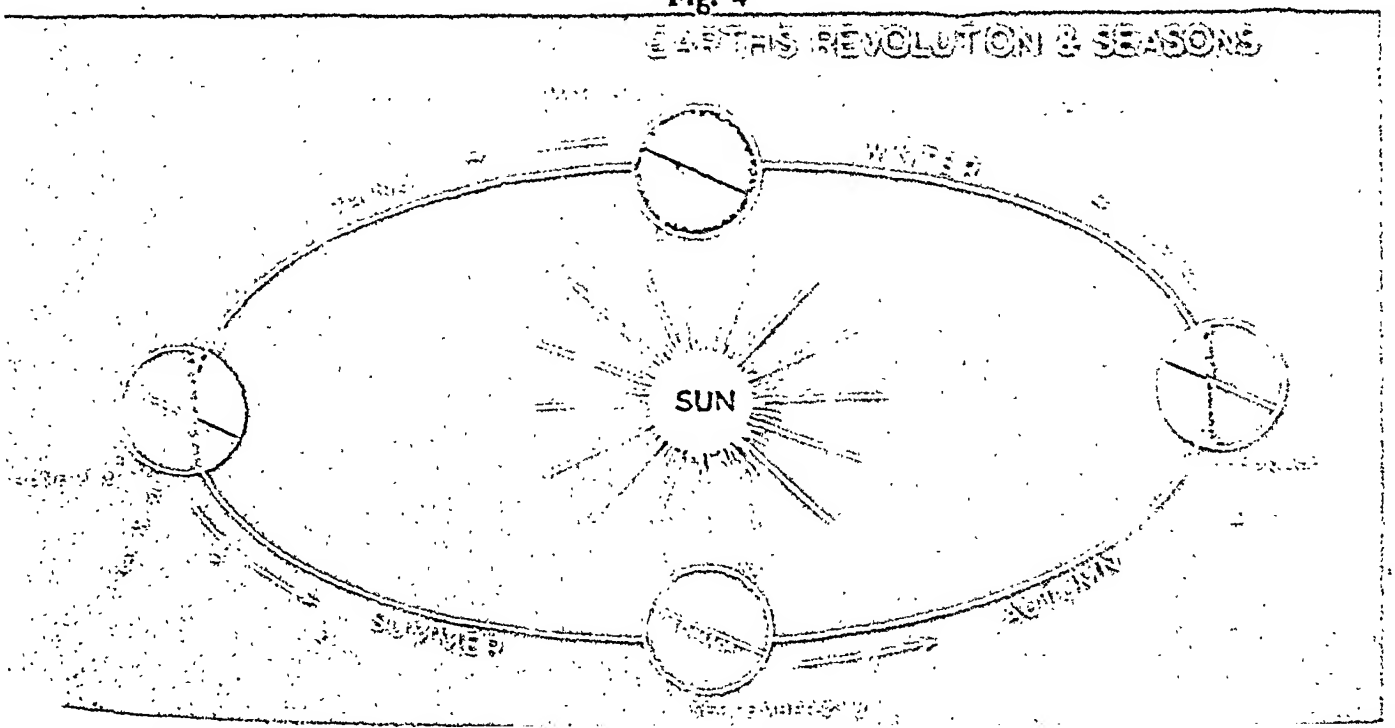
Revolution of the Earth round the Sun

In the illustration in Figure 4 the artist attempts to show some other interesting facts about the motions of the earth. Note the drawing of the earth on the left side of the illustration. The line drawn over the face of the earth represents its imaginary axis. You can see that the earth is tilted. That is, its axis is slanted. It is also clear from this picture that the earth travels round the sun. This motion of the earth is called **revolution.** While it is revolving round the sun the earth remains tilted to the same extent and in the same direction.

One important result of this fact is shown in the illustration. Notice that when the earth is in its June 21 position, the area close to the North Pole will have continuous daylight because the North Pole is tilted towards the sun. The sun's rays will light up this area continuously even though the earth rotates. At the same time; the area around the south pole does not get any of the sun's light. This means that it will have continuous darkness because the sun's rays cannot reach it.

The picture changes, of course, as the earth travels on its path around the sun, tilted to the same extent and

Fig. 4



in the same direction. In the December 22 position of the earth, the North Pole is in complete darkness because the South Pole area is tilted towards the sun. And the North Pole area remains in complete darkness even as the earth turns on its axis. The sun's rays cannot reach it. At the same time, the area around the South Pole has continuous daylight. Thus because of the earth's tilt on its axis, the North and South poles have long periods of continuous daylight or darkness.

To understand fully the importance of the earth travelling around the sun, you must study the illustration given in Figure 5.

You will notice that the shortest and most direct rays of the sun are falling at *A*. At *B* and *C* the rays are longer and touching the earth at a slant. The shortest and most direct rays of the sun cover a smaller area of the earth's surface than the longer, slanting rays. Since the warmth from the longer, slanting rays is spread over a greater area, these rays will appear to be cooler than the more direct, short rays. The more the rays are spread out, the less heat they will give to the part of the earth they touch.

Also, as you know, there is a covering of air around the earth. This air takes up some of the sun's heat as the rays pass through it. When the rays come at a slant, they go through more of this covering of air. They lose more heat. As a result, they are colder.

Change of Seasons

The illustration in Figure 4 shows that during part of the trip round the sun in the June 21 position, the North Pole is tilted towards the sun. At that time the sun's rays shine more directly down on the northern half of the world. This part of the earth has longer days because it faces the sun for a longer period of time. The northern lands, therefore, are warmer than they were in the earlier months. They are now having their summer. But in the southern hemisphere at that time the sun's rays shine at a slant and the days are shorter. The southern lands, therefore, have their winter.

At another time during the trip in its December 22 position, the South Pole is tilted towards the sun. In the southern hemisphere the sun's rays are now more direct than in winter and the days are longer. The southern lands, therefore, are warmer than they were. It is now their summer. In this position the northern lands get less direct sunshine and the days are also shorter. Therefore the northern lands now have their winter season.

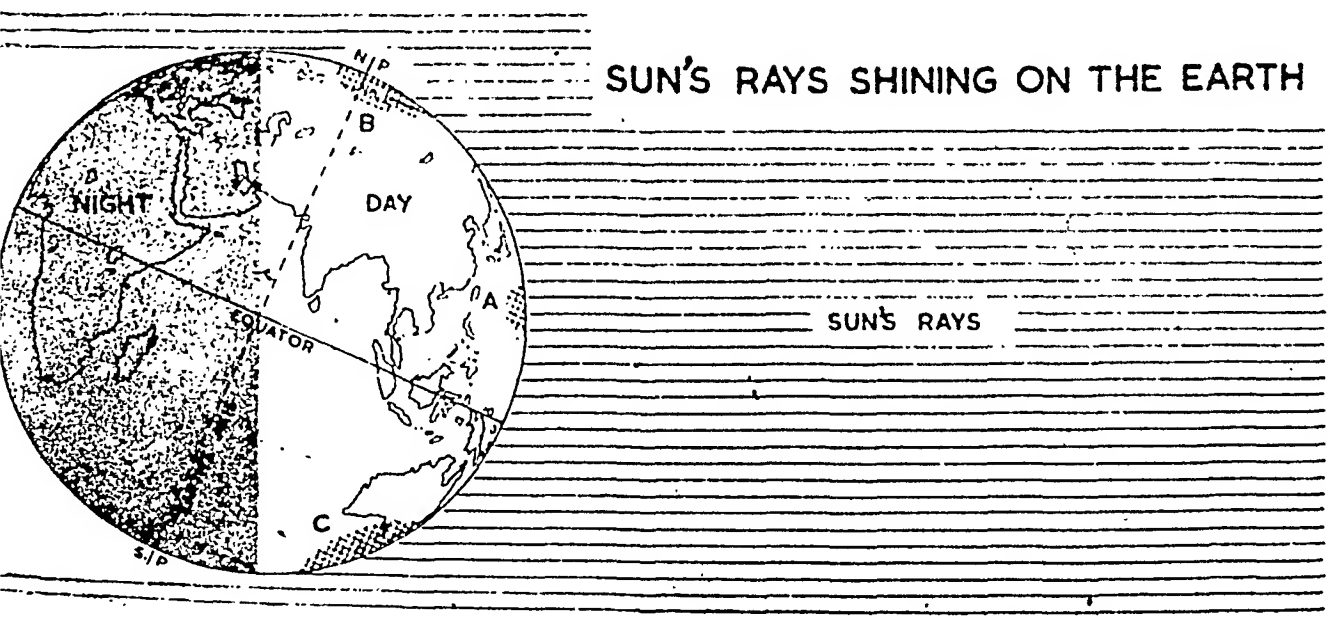
When the earth during its trip round the sun is in its September 23 and March 21 positions, neither of its poles is tilted towards the sun. During these periods the sun's rays shine directly over the part of the earth which lies in between the two poles. The days and nights are equal all over the world in these positions. Therefore the northern and southern hemispheres now have seasons which are neither too cold nor too hot.

The seasons of the year are due to the tilt of the earth as it travels around the sun.

The earth takes a full year to revolve round the sun. This movement of the earth, therefore, is also called the **annual motion** of the earth. The time taken by the earth in one trip round the sun is 365 days and 6 hours. This period of time is used in making our calendar year. The calendar year is made up of 365 days and every fourth year, it has 366 days. This fourth year is called a **leap year** and in such a year February has 29 days. In this way, the 6 hours or the one-fourth of a day is recorded without too much difficulty.

All this may lead you to believe that the earth travels very slowly. But remember that the trip is a very long one. It is about 96 crore kilometres long. You are actually travelling with the earth very fast—about one lakh seventy-two hundred kilometres in an hour. And in a minute you are travelling about 1800 kilometres or 30 kilometres in a second. And

Fig. 5



remember, too, that while you are travelling so fast with the earth on its path around the sun, you are also travelling in another direction with the earth as it rotates on its axis. As you know, the earth takes one complete turn on its axis every twenty-four hours. This means that you are travelling in Delhi with the earth at a speed of about 1200 kilometres an hour.

Questions to answer

1 *List all the reasons why you think that the rotation of the earth on its axis is an important movement.*

2 *List all the effects of the earth's revolution round the sun.*

3 *What do you suppose would happen if the earth did not rotate ? What would be affected ?*

4 *What difference would it make if the earth rotated in a westerly instead of an easterly direction ?*

5 *If the earth were not tilted, what effect would it have on our lives ?*

6 *You read that you are travelling with the earth in Delhi at a speed of about 1200 kilometres an hour as it rotates on its axis. If you lived closer to the north or south poles you would be travelling at a slower speed. Study the illustration of the earth in Figure 3 and find out why this is so.*

7 *Explain why Srinagar has more hours of sunshine than Trivandrum in June.*

8 *How many trips have you made round the sun ?*

Things to do

Prepare a model of the earth's revolution round the sun with the help of your classmates.

3 Lines on a Globe

Drawing the Earth

In earlier classes you learned to use a map. You also learned that a map is really a drawing which helps you to see a part of the world. As men began to travel more and more, they learned more about the earth on which they lived. They learned, among other things, that the earth was shaped like a ball. Although some men who lived several thousands of years ago believed this to be true, it became an established fact much later in history.

When men tried to make maps to show the world as they saw it, they found this could be done only if their drawings were put on something shaped like a ball. They called this map shaped like a ball, a **globe-map**, or **globe.**

The globe is almost of the same shape as the earth. Because of this, the map makers can show everything just as they see it. All the lands can be shown in their right place and shape. You can compare the size of oceans, islands or pieces of land and be sure that your comparison will be accurate. This is because a globe makes it posisble to show all things in the correct size, shape and place relationship to each other. In this way we can say that a globe is a small scaled model of the earth.

The Equator and Parallels

Before globe-maps were made, men found it difficult to describe the exact location of places on maps. They decided that lines drawn on maps would help them tell others about the location of places. They drew a number of imaginary lines on maps of the earth. One of these lines circled the earth at a distance which is exactly halfway between the North Pole and the South Pole. They called this imaginary line the **equator.** The line divides the earth into two equal parts, a northern half and a southern half. Or, as geographers call them, the **northern hemisphere** and the **southern hemisphere.**

In Figure 6 you will find the equator dividing a circle into two equal parts. Notice the three small dots, one labelled 'X', one 'Y' and the other 'Z'. Can you describe the position of 'X' and 'Z' on the circle ? Can you tell others where 'X' is located and where 'Y' is in relation to 'X' ? It would probably be difficult to do this. You

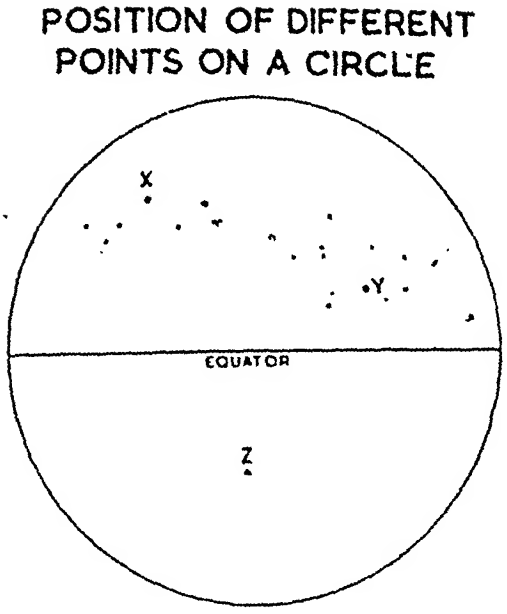


Fig. 6

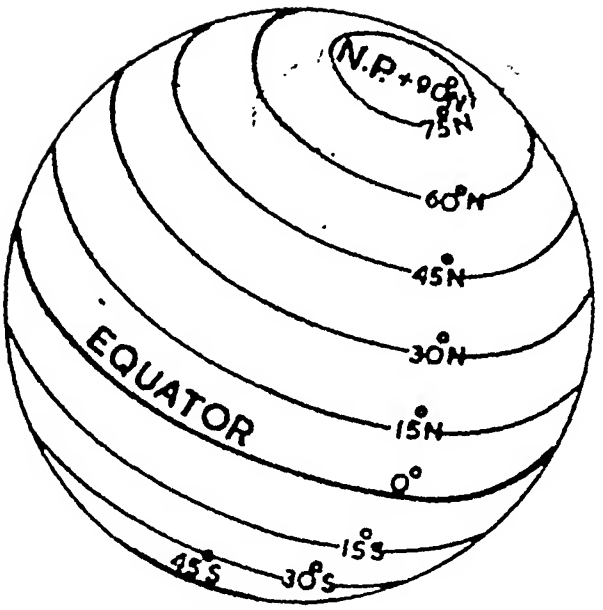
could be much more accurate in your description if more lines were drawn.

On a globe, you can find a number of east-west lines that encircle it. Each of these lines is the same distance north or south of the equator all around the earth. They are parallel to the equator. Parallel lines never meet or touch each other, no matter how long they are. This is because they are always exactly the same distance from each other. This is also true of the east-west circles on a globe. They are parallel to each other and are therefore called **parallels** or **parallels of latitude.**

The first illustration in Figure 7 shows that the equator is called the 0° parallel. Each of the other parallel circles has a number between 0° and 90°. If this illustration had been large enough, the artist could have drawn 90 parallel circles in the space from the equator to each of the poles. Instead, he decided to draw five circles in the northern hemisphere and five in the southern hemisphere. Two circles in the southern hemisphere cannot be seen because of the tilt of the earth on its axis. In addition to a number, each circle is labelled with a N or S. This indicates whether it is north or south of the equator.

Look at the second illustration in Figure 7. The lines on the drawing are half-circles that run from one pole to the other. They are the north-south directional lines found on a globe. Note that they are not parallel. They are not at equal distances from each other at all points. They actually meet at the poles. These lines are called **meridians.** This word comes from two other words meaning 'middle' and 'day'. These lines are called 'meridians' because when it is noontime or midday at one place on a meridian, it is noon at all places on that meridian. These lines are also called **meridians of longitude.**

From this illustration you can see that one of these meridians is called the **prime meridian** or 0° meridian. The word 'prime' means first. When used with meridian, therefore, it means the first meridian or the meridian used as a starting point for numbering other meridians. Any of these lines could



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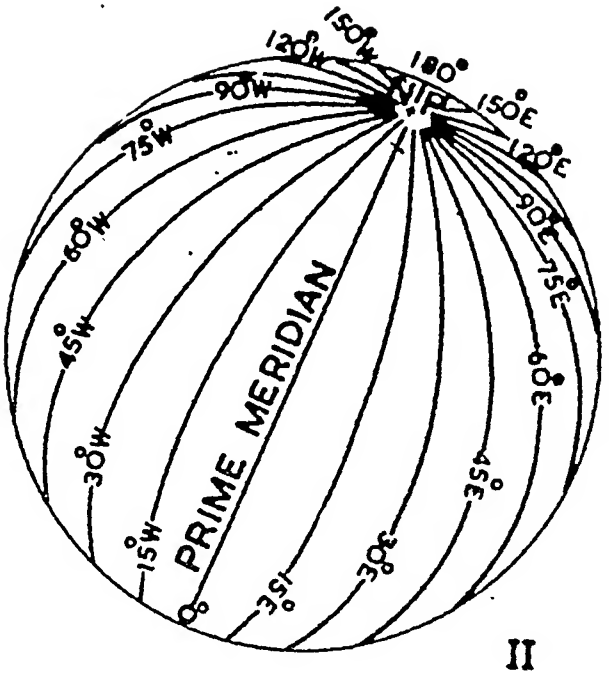
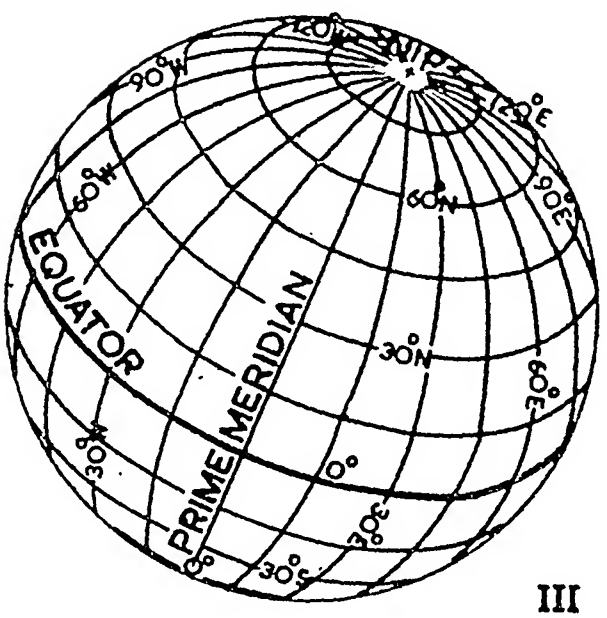


II

PARALLELS & MERIDIANS



III

Fig. 7

be used as a starting point. In fact, many years ago this was actually so. A globe or map made in one country could have a different prime meridian than one made in another country. You can imagine how confusing this would be. At a meeting held over 80 years ago, representatives from many nations met and agreed to use the meridian passing through the Royal Observatory at Greenwich in England as the starting point for numbering all meridians.

These half-circles are numbered from 0° to 180° and all except two have a letter, E or W, to show whether it is east or west of the prime meridian. The 180th meridian is not labelled with a letter. It is the meridian numbered 180° and is exactly halfway around the world from the prime meridian. Like all meridians it can be reached by travelling in either an easterly or westerly direction from the prime meridian.

Observe the prime meridian and 180° meridian on a globe. These two make a complete circle. This circle divides the whole earth into the **eastern hemisphere** and **western hemisphere.**

Locating Places on a Map

In the third illustration in Figure 7, both the parallels and the meridians are shown. They cross each other and form a **grid.** This grid makes it easy to describe the location of any place on the earth. Look at the map of the world (Figure 9). In what country does the 30° S parallel cross the 140° E meridian ? In what ocean does the 30° S parallel cross the 90° E meridian ?

Questions to answer

1 *Think about parallel circles and meridian lines found on a globe and then list as many ways as possible in which they differ.*

2 *What is the other name for the 0° parallel ?*

3 *What is the other name for the 0° meridian ?*

4 *What do you understand by 'northern hemisphere' and 'southern hemisphere' ? With the help of a map given in Figure 12 prepare a list of three countries of each hemisphere.*

5 *Is it possible for a globe to have more than 90 parallel circles north of the equator ? Explain.*

6 *Explain why you can reach the 180th meridian by travelling in either an easterly or westerly direction from the 0° meridian.*

Things to do

1 *With the help of a map of India fill in the blank spaces in the table given below :*

Name of the city	*Nearest Parallel*	*Nearest Meridian*
Jaipur	——	76° E
———	29° N	77° E
———	19° N	73° E
Madras	13° N	———
———	27° N	81° E

4 Reading World Maps

An Experiment of Drawing a Map on an Orange

In Chapter 3, you learned that a globe is one of the most accurate maps of the world. But it is difficult to show the round earth on a flat surface. You can see how difficult this is by getting an orange and drawing some of the lands of the world on it. Then use a knife to cut through the skin at a point about where the equator would be. Cut round the entire orange and then peel the upper half of the orange very carefully. Try to keep the upper half in one piece. Then, try to flatten this piece so that it will lie smoothly on a flat surface. You will find that it splits in many places. The lands you drew are probably split into several parts. This will not be a very good map and you may wish to give up the attempt to show the surface of the round earth on something flat. Map makers, however, continue to search for the best way to do this.

Different Kinds of Maps

In Figure 8 you can see a series of three pictures of a globe. This is one way to show the earth on a flat surface using a number of pictures of a globe. It is not, however, the best way. You can see only a small part of the earth's surface in each picture. It would take about four more pictures to show all of it.

The world map in Figure 9 is called a Mercator map. It was first made by a man named Gerhard Kremer who put the name of Gerhardus Mercator on all the maps he made. Unlike the lines on a globe, the lines on this map are all straight. Notice, also, that the meridians are always the same distance from each other at any point. They do not meet at the poles. In fact, the poles cannot be shown on this map. Notice, too, that the parallels are spaced farther and farther apart as you move toward the poles.

It is interesting to see how all this affects some of the lands shown on the map. Look at Greenland and South America on the pictures of the globe. Which is bigger ? Now look at these same lands on the Mercator map. Which is bigger ? In this kind of map, the lands close to the poles are much larger than they should be. The Mercator map is not for all purposes very good for studying the world.

A polar map given in Figure 10 is another way in which the world may be shown on a flat surface. It shows

GLOBE PICTURES

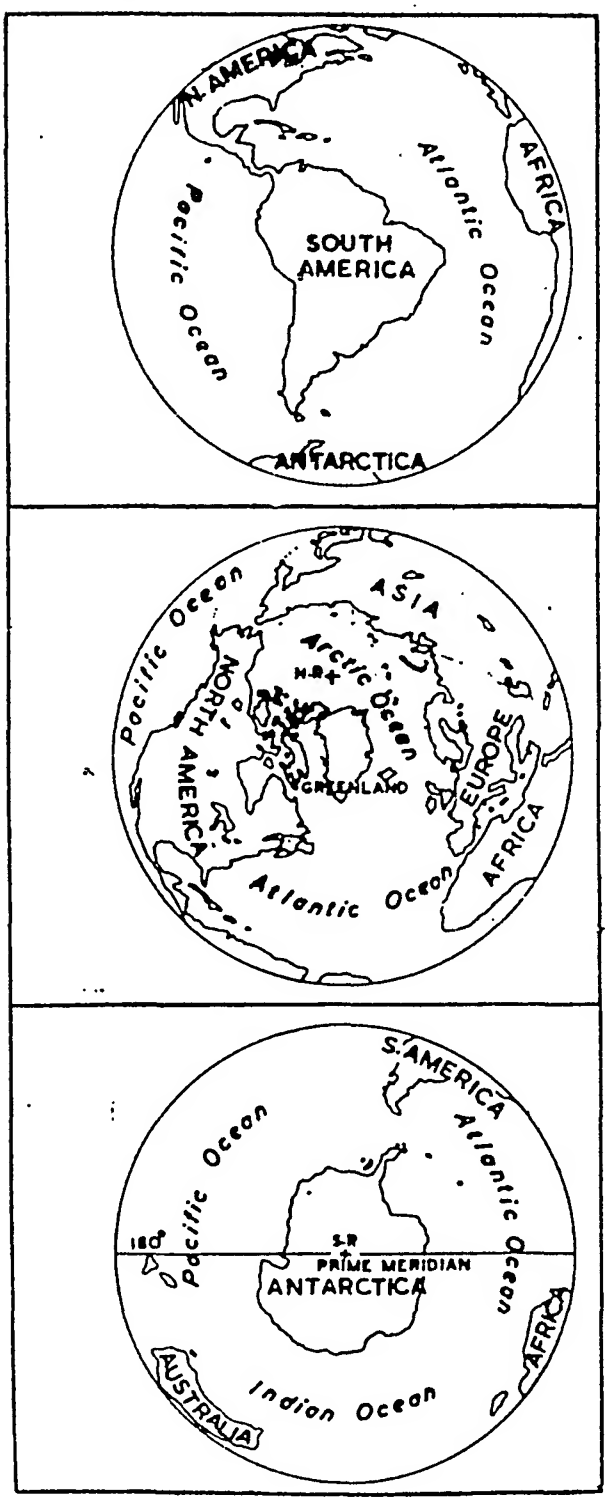


Fig. 8

how most of the major lands of the world face one another across the North Pole. This is helpful when you want to find the shortest route between these lands. Look at the Mercator map and find the shortest route from India to the United States. What direction does your route take ? Now look at the polar map again and find the shortest route from India to the United States. Does it appear to be shorter than the route you found on the Mercator map ? Note, also, that the directions of the route on the polar map changes as you travel. It moves from a northerly to a southerly direction. One disadvantage of this map is that the lands far from the centre are not shown in their proper shapes or sizes. Compare Africa and Australia on this map with the way they are shown on the map in Figure 9. What do you find ?

The world maps given in Figures 11, 12 and 13 are probably the ones you will use most in this class. You can compare the size of one country with that of any other country and be sure it is as accurate as a globe. And, the shapes of lands are as good as map makers can show them on a flat surface. These reasons make them the best ones to use for our purposes.

Today map makers can give much information about the world in map form. As you study this book, you will be able to read maps which give

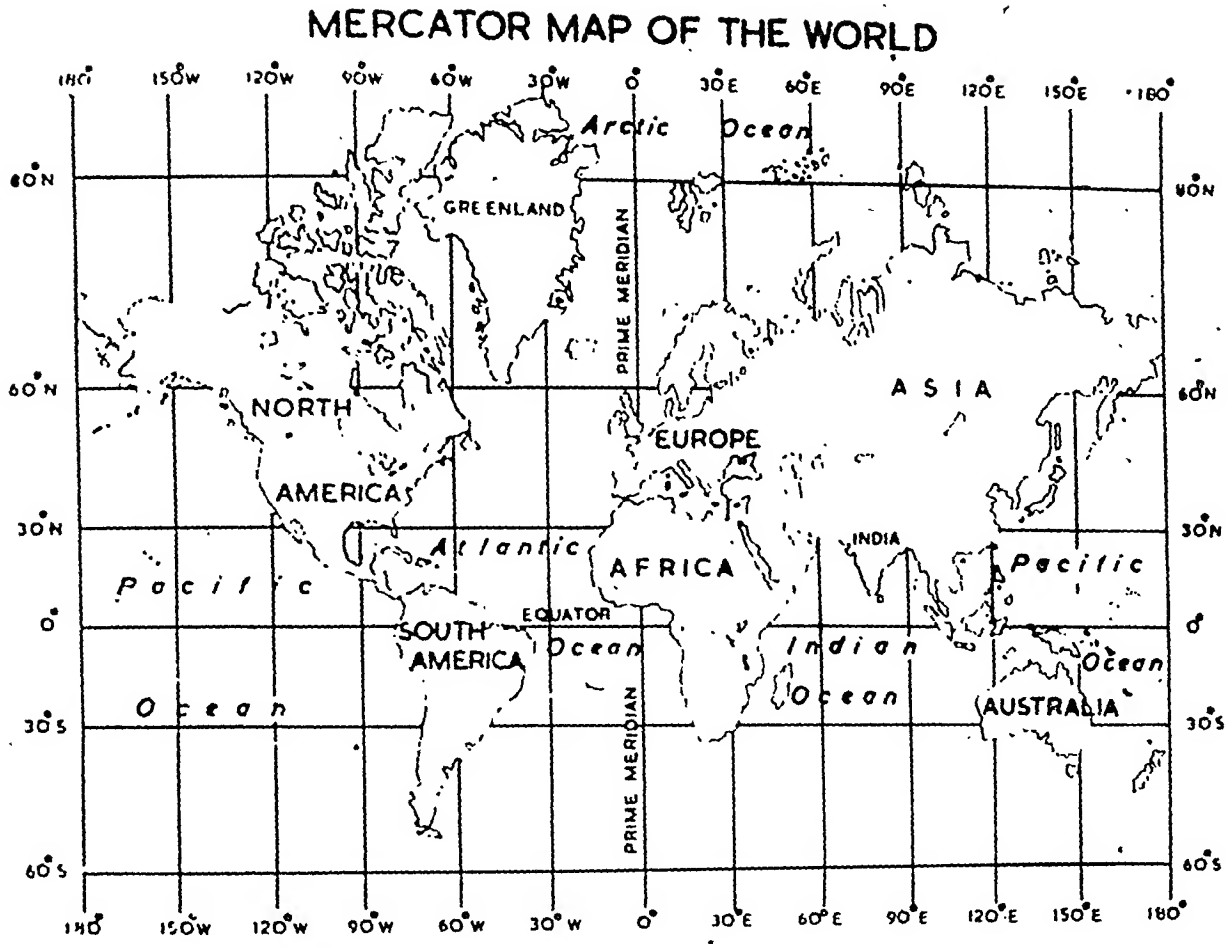


Fig. 9

POLAR MAP OF THE WORLD

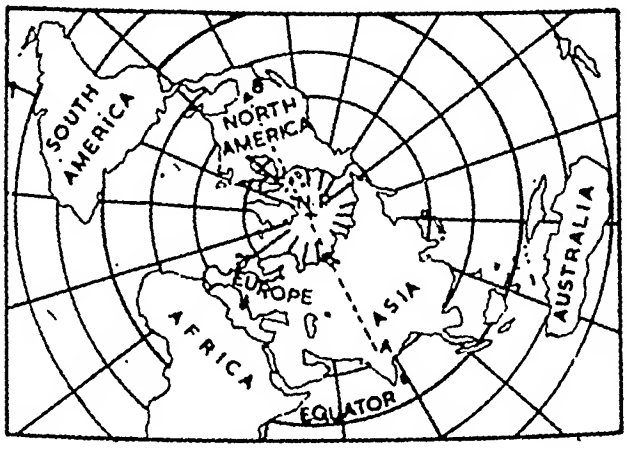


Fig. 10

information about rainfall, some which tell about desert lands, and still others which show the main routes used by airplanes and ships.

How to Read Maps

Of course, there are many other kinds of maps, each with its own story to tell. But as with books, you must know how to read them if you are to get all the information possible from them. Suggestions given on the following pages will help you to do that.

1 *Study the key.* The key, or egend as it is sometimes called, is the ıost important clue to the information ou can get. The symbols or signs ısed and what they mean are explained n the key. Sometimes a sign used ın one map may mean something ıuite different from the same sign on nother map. For example, the dots ın the world population map in Figure 13 stand for people. On the nap in Figure 11, dots stand for leserts. It is important, therefore. to tudy the key before attempting to read a map.

One of the most used symbols is colour. The key to the world map in Figure 11 uses colour to represent elevation or height above sea level. Note that the dark brown colour stands for land 3000 metres or more above sea level. As the colour gets brighter and lighter, it stands for land which is closer to sea level. Yellow stands for plateaux. Dark green stands for low-lands that are from 0 to 600 metres above sea level.

2 *Study the distance scale.* The distance scale, as you know, is the measuring line. It denotes the relationship of the distance between any two points on the map with the actual distance between the same points on the ground. Each map may have a different distance scale, because each shows a different amount of the earth's surface. The more the area covered by a map, usually the more is the distance represented by a given piece of the measuring line. When it is important to know distances, study the distance scale.

Study the scale of the map in Figure 12. Each centimetre of this map represents about 1100 kilometres of the earth's surface. On this map study the location of Cape Comorin in our country and that of North West Cape in Australia. These are shown by a symbol (+) in the map. Find out the direct distance between these points in kilometres.

3 *Look at the lines.* Maps are often used to find out directions. But often people fail to look closely at a map and hastily decide that north is at the top of the map, south is towards the bottom edge, west is towards the left edge and east towards the right edge. The polar map in Figure 10 shows that this is not true with every map. The only sure way of finding directions from one place to another is to follow the parallel or meridian lines.

Study the population map in Figure 13, using the suggestions given above. This map has a simple key. It states that each dot stands for ten lakhs of people. You can see quickly that it would be difficult to count

THE WORLD – POLITICAL

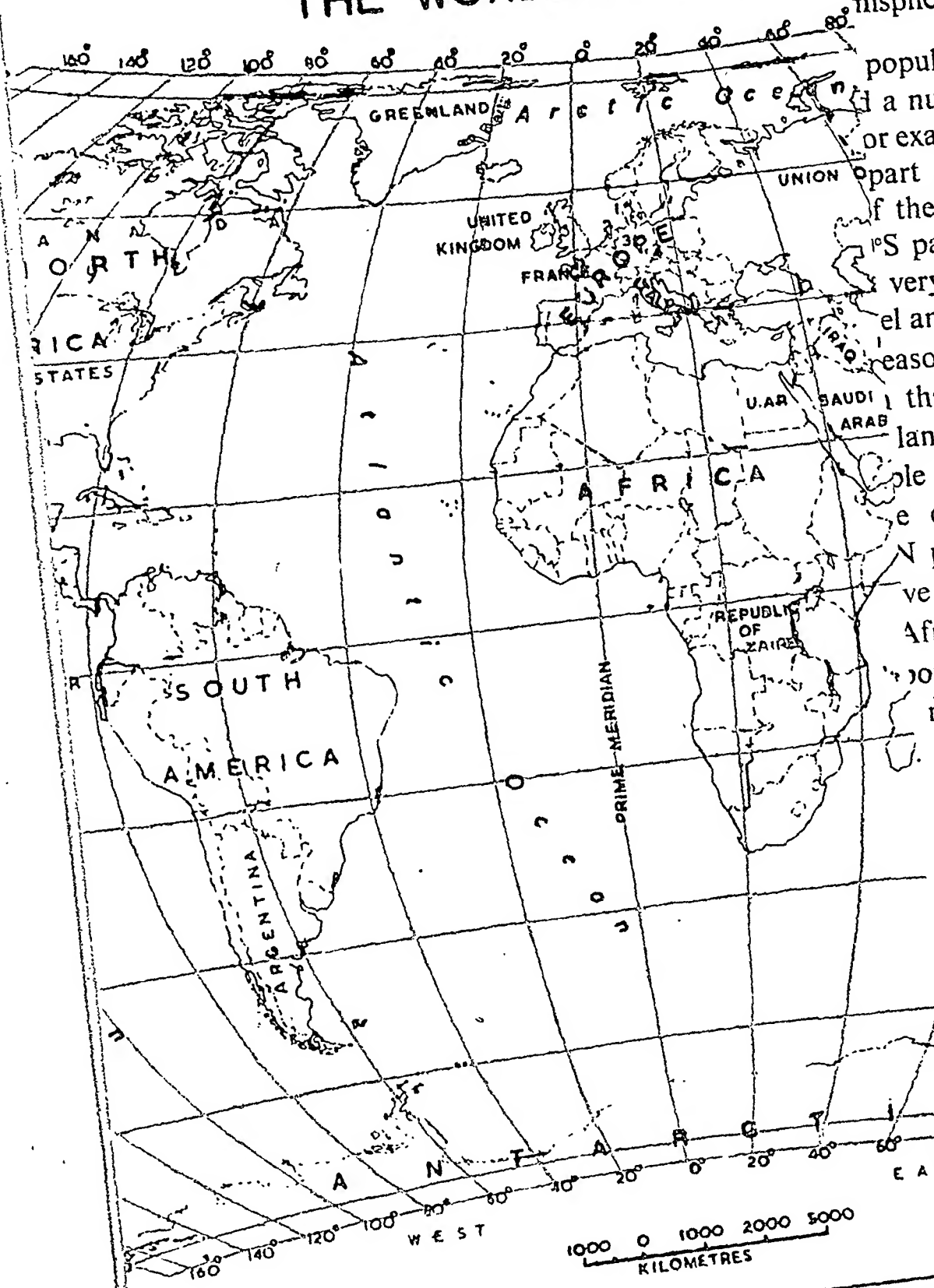


Fig. 12 The territorial water measured from the a

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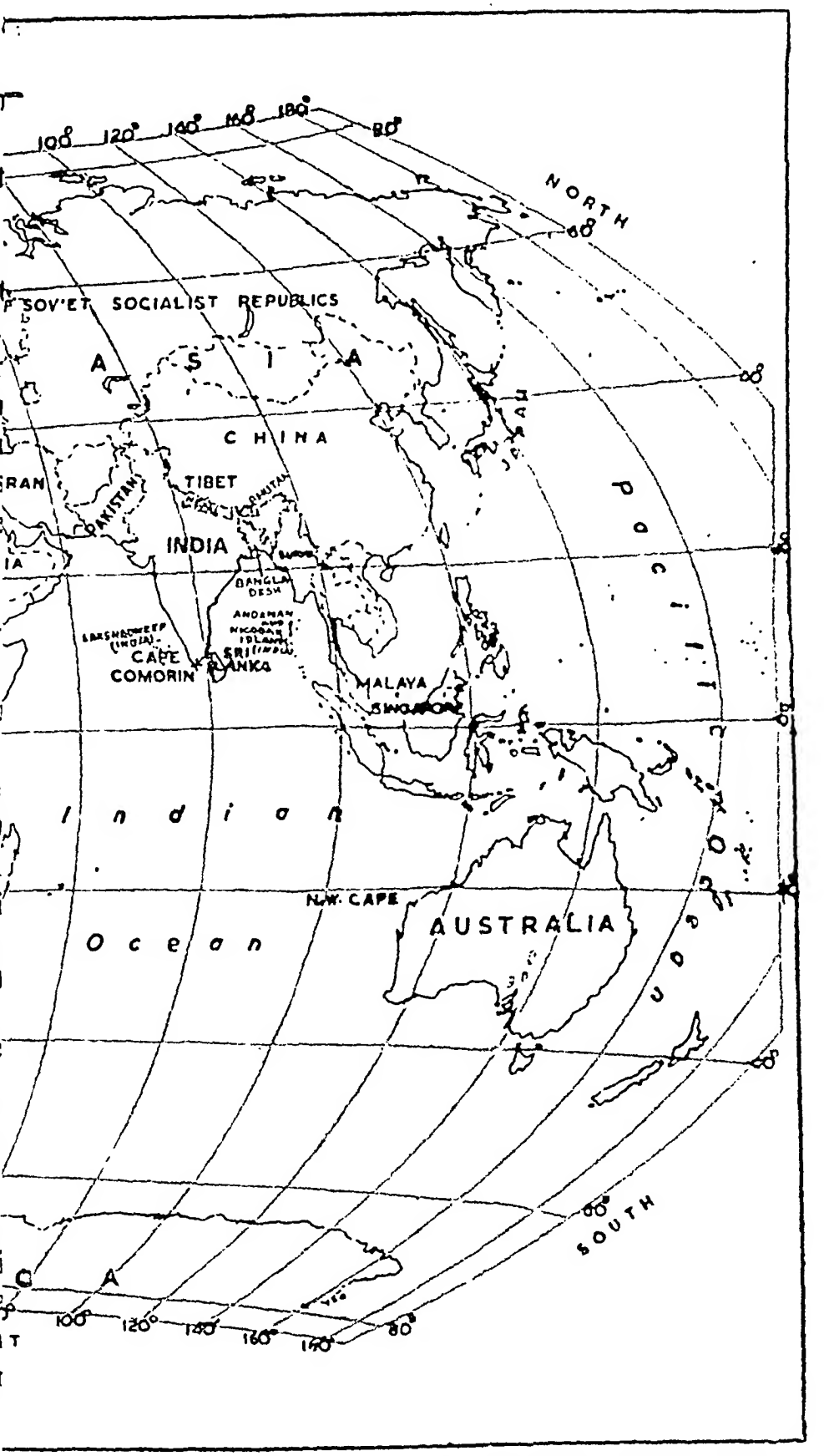


s of India extend into the sea to a distance of twelve nautical miles
ppropriate base line.

each dot in some lands. This is especially true in our country where there are many people in some areas. This map, then, can tell us only such things as where most of the people of the world live and which lands have very few people. When looking at the map remember that the ten lakhs of people represented by each dot may all live in a big city or in a few towns or in many villages.

Note the information given by the distance scale. Each centimetre on this map is equal to 1000 kilometres on the earth's surface. This information makes it possible for you to find out the approximate distances from one part of the world to another. The directional lines help you to see if more people live in the northern or southern hemispheres. You can also compare the number of people living in the eastern hemisphere with the number in the western hemisphere.

If you study this world population map carefully, you may find a number of unanswered questions. For example, why is it that only a small part of the world's people live north of the 60°N parallel and south of the 40°S parallel. You can see that there is very little land south of the 40°S parallel and that would, of course, be one reason why many people do not live in that part of the world. However, the land there does not have many people on it. Why ? There seems to be quite a bit of land north of the 60°N parallel. Why don't more people live there ? Why is it that portions of Africa and South America are sparsely populated? To answer these questions read the next and following chapters.

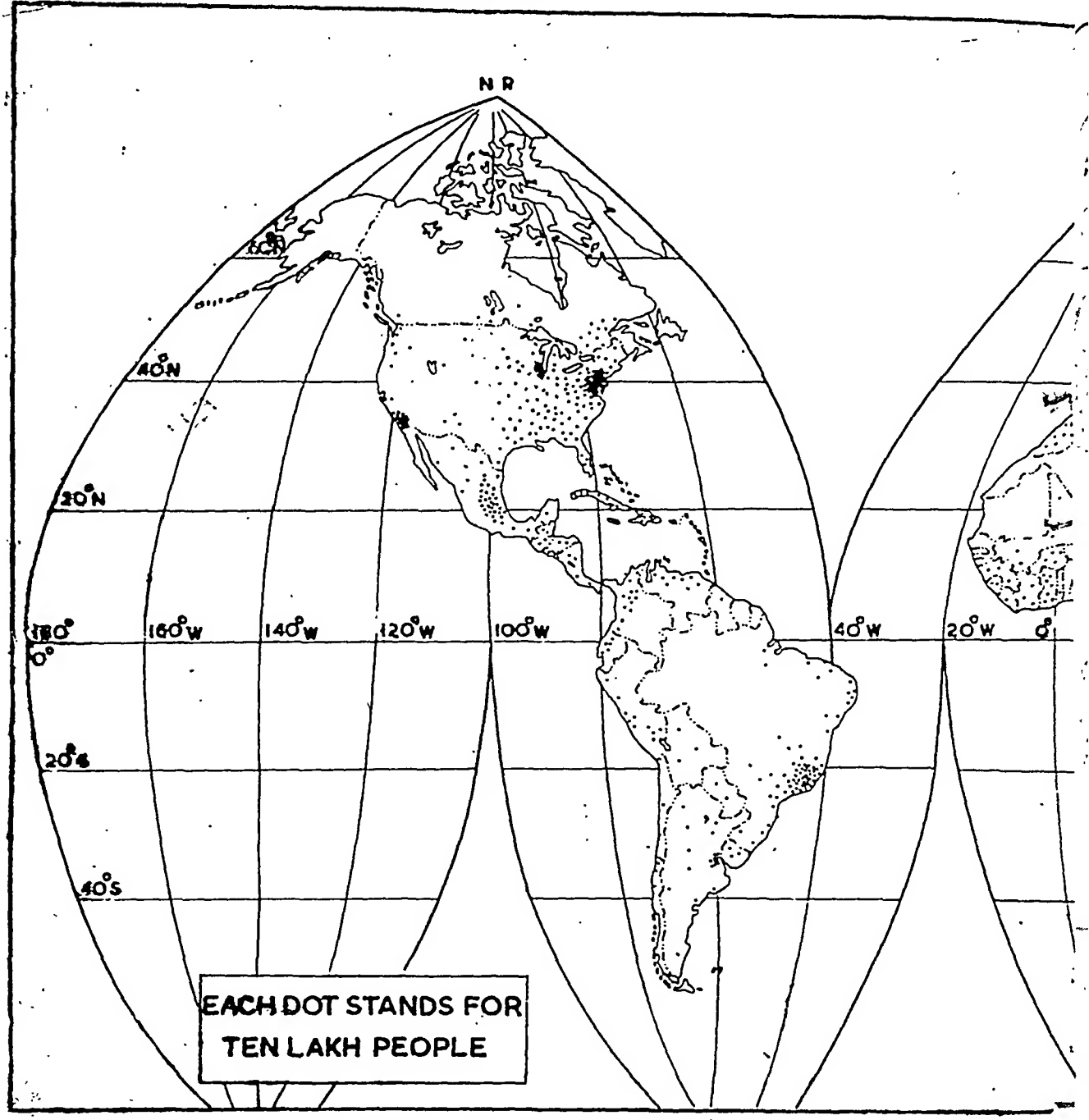
Questions to answer

1 *Look at the world Mercator map in Figure* 9 *and the coloured world map in Figure* 11. *List as many ways as possible in which they differ.*

2 *Use any of the maps given in this Chapter and find the answer to the following questions :*

(*a*) *What meridian runs through our country ?*

(*b*) *Between what parallels do most of the world's population live ?*



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

(c) *Can the North and South Poles be shown on a Mercator map ?*

(d) *A route laid out on a polar map in Figure* 10 *takes you from the point A on the map directly to the point B. In which directions will you travel if you follow that route ?*

(e) *Which flat map would you use to find the shortest route between two places ?*

(f) *What continent is located totally south of the equator ?*

(g) *Why does the area to the north and north-east of India have fewer people living there ?*

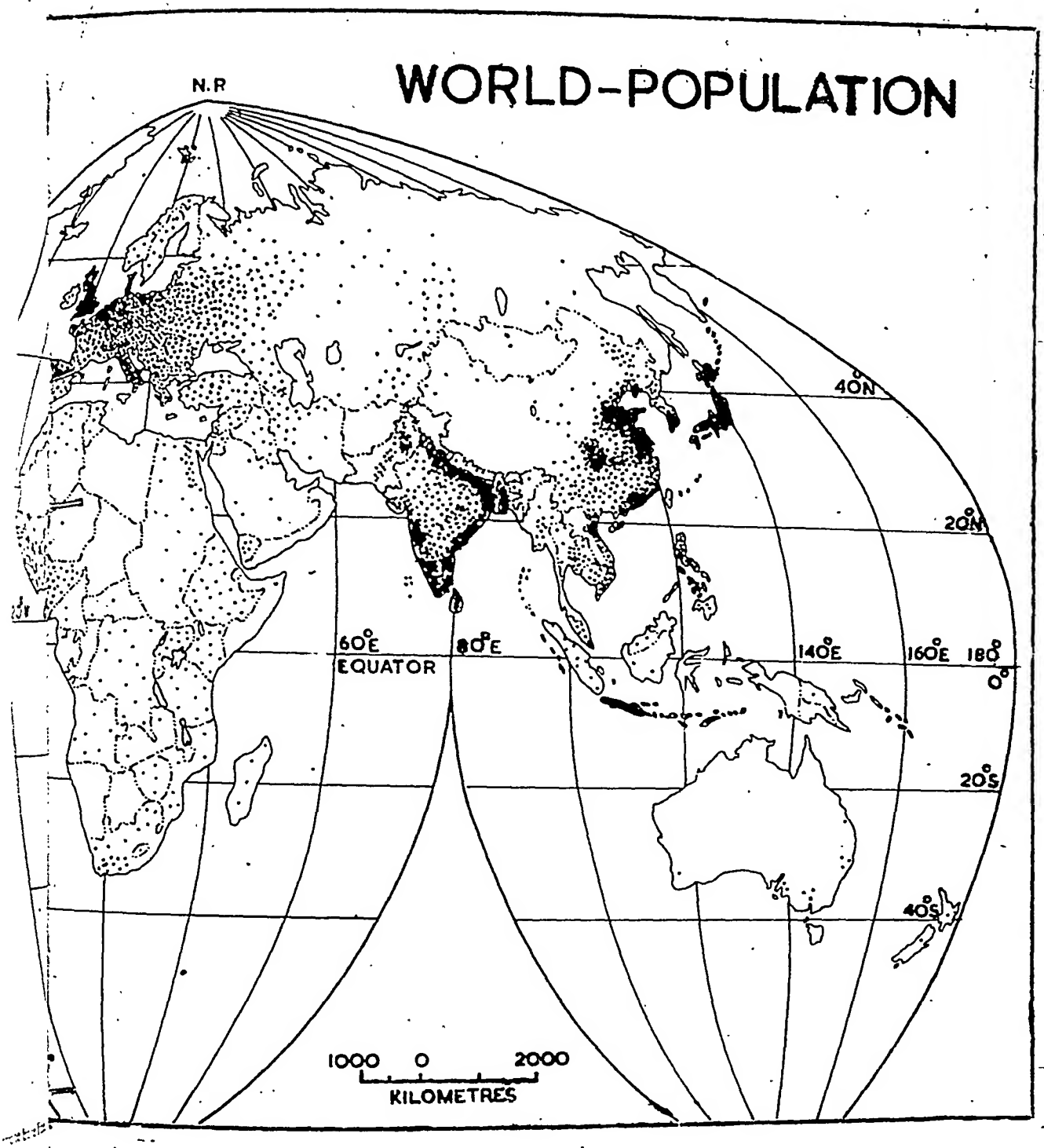


Fig. 13

(*h*) *What continents face each other across the Arctic Ocean ?*

3 *Why do many people like to use a globe-map when studying the world ?*

4 *What is the difference between a country and a continent ?*

5 *With the help of the map given in Figure 12 prepare a list of all the continents and all the oceans on the earth.*

Things to do

5 What makes Climate

Weather and its Importance

When it gets very warm or unusually cold out-of-doors, people are quick to talk about the weather. They usually say how uncomfortable they feel. When there is so much rain that rivers overflow or when there is so little rain that crops dry up. The problems caused by such unusual weather conditions are self-evident.

Weather is important. The houses we live in, the clothes we wear and the food we eat all depend on the weather in our area. The way we travel from one place to another depends upon the weather. Weather can even be the reason why people do not live in certain places in the world.

Climate

When we describe the kind of weather any place has year after year, we describe it as the **climate** of that place. We usually say that a place has a hot or cold climate, or a dry or wet climate, meaning, that the temperature of the air is hot or cold or, it rains very little or very often.

There is a great deal of difference in the climate of different places on our earth. Some lands are quite cold throughout the year. Some are warm all the year round. In some places, the climate is hot during a part of the year and cold during another. Some places have little rain during certain seasons while some have a continuously dry climate. In some parts of our country it rains throughout the year. In other parts, rain falls in certain seasons only.

Factors Influencing Climate

What causes the climate of a place to be what it is ? There are many things that help to make climate. The most important are :

1 *Distance from the Equator.* The distance of a place from the equator or its nearness to the North or South Pole helps to determine the climate of that place. You know now that the most direct rays from the sun—rays which shine on the earth when the sun is highest in the sky—are the warmest. You also know that because the earth is tilted in the same direction and to the same degree as it revolves around the sun, the most direct rays strike the earth at different places as it makes its journey around the sun. But that part of the earth's surface located near the equator

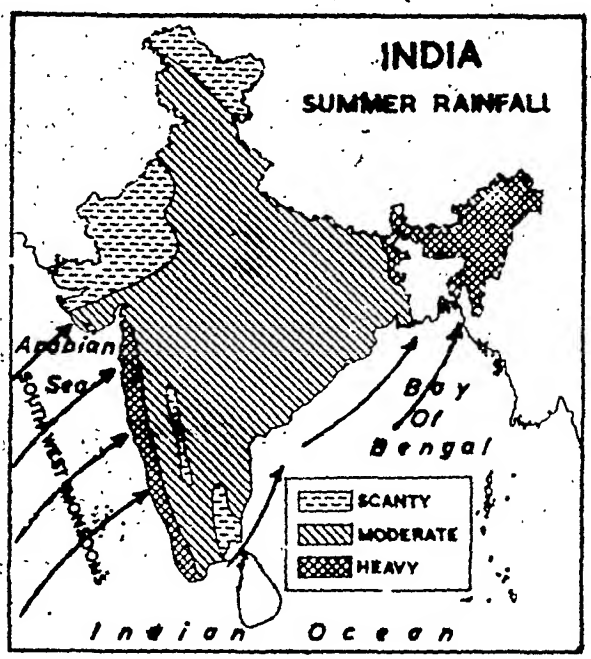
receives more direct rays than the areas near the poles. In fact there are times when the areas very close to the poles receive no sunlight (see Figures 4 and 5). This means that parts of the earth's surface will be warmer than other parts. The area near the equator—the **low parallels**—is warmer than the area in the **middle parallels.** The areas in the **high parallels**—near the poles—have the coldest climate.

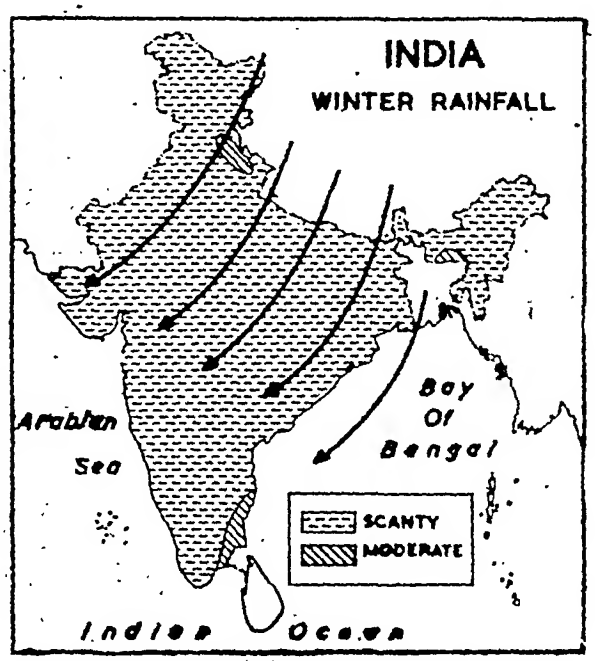
2 *Direction of Winds.* The direction of winds often helps to make up a climate. In order to understand fully why this is true, we need to know something about wind—what it is and what makes it blow ? Wind is air in motion. When air gets warmer, it expands, becomes lighter and rises. Cooler air rushes in to take its place. The movement of the air is wind. If the wind blows from a direction where the temperature of the air is cool the winds will be cool. On the other hand, if the movement of air is from the hot, desert areas, the winds will be warm.

Winds affect climate in at least one other way. Air, as you know, is a carrier of water. That is, water lying on the earth's surface is taken up by the air and sometimes carried over great distances. When water gets into the air in this way we say it **evaporates.** This means it breaks up into minute particles of water which are so small and light in weight that you can neither see nor feel them. Therefore, if winds come from a direction in which there is a large body of water, they will carry some water. Sometimes this water appears as rain. When it is very cold, it takes the form of snow.

Look at the two rainfall maps in Figure 14. One shows the rainfall in various parts of our country during summer and the other shows rainfall during winter. The arrows show the direction of the wind. During the six months summer from May 1 to October 1, the winds come across India in a south-westerly direction, crossing the Indian Ocean, the Arabian Sea and the Bay of Bengal. This happens because at that time of the year the land is warmer than the ocean. The warm air over the land rises and the cool air over the ocean blows in to take its place. This air, sweeping in from the ocean and carrying many particles of water, is called the **south-west monsoon** winds or **summer monsoon** winds.

If you study the map you will notice that the rain from the south-west monsoon winds falls more heavily in certain areas of India than others. One reason for this is because of the location of high hills and mountains. Note that the western coastal strip





The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

Fig. 14

has a heavy rainfall at this time. The winds carrying the water are forced upward when they reach the hills and mountains of the Western Ghats. When they move upwards, they cool rapidly. And, when air carrying water cools rapidly, the tiny particles of water come together and form drops of water. When the drops become so big and heavy that the wind cannot hold them, they fall as rain. Find another area in India which has a heavy rainfall during May 1 to October 1. Can you tell why this is so ?

Study the second rainfall map. This covers the period from November 1 to April 30. Notice that during this period most of the winds come from a north-easterly direction. These are known as **north-east monsoon** winds or **winter monsoon** winds. Note also that India as a whole has less rain during this period than during the summer. Can you tell why ? This map also shows that there is more rain in parts of the eastern coastal area than other sections of our country. You should know why.

3 *Distance from the Sea.* The climate of a place is also affected by its being near to or away from the large bodies of water. During summer the sun warms both land and sea. But the sea does not become as warm as the land. Therefore, if a place is situated near the sea, a wind from the sea will bring cool air in summer and lower the temperature, while a place

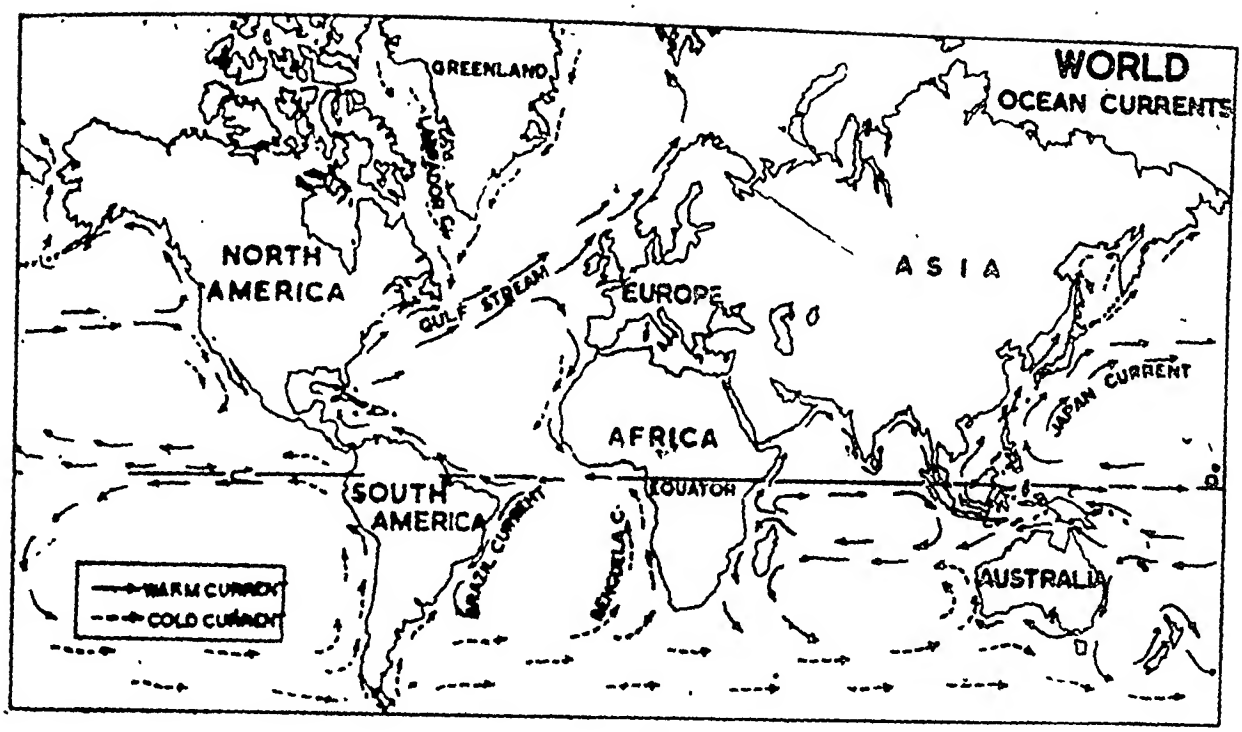


Fig. 15

situated away from the sea will be hotter.

During winter the land loses the heat it has gained during the summer much more quickly than the sea, so that in winter the sea is warmer than the land. Therefore, in winter, winds from the sea are warm and raise the temperature of a place near the sea, while places situated away from the sea will be cooler.

The map in Figure 15 shows another way in which large bodies of water affect climate. Note the smooth and broken arrows, labelled **currents** in the major oceans of the world. These currents are streams of water pushed along by winds. They change the climate of the lands they touch. If they are warm currents they make the coastal areas of the lands warmer than the inland areas. This is true of the Japanese current as it touches the Japanese Islands and then touches the west coast of the United States. In this way, nearness to a large body of water can change climate.

4 *Height above Sea Level.* The height of land above sea level can also affect climate. We already know that high mountains can be one of the reasons for heavy rainfall. Height of land above sea level also affects temperature. Air in areas high above sea level is thinner and colder.

Climate in our country and other parts of the world depends on a number of things. It may be the

result of the amount of direct rays received from the sun. It may be due to the nearness to the sea, the direction of winds or height above sea level. All these things together make climate in various parts of the world quite different. The importance that this has on the way that peoples of the world live, is an interesting story that is presented in the next Unit.

Questions to answer

1 *List all the things which determine the climate of a place.*

2 *What things will determine the amount of rainfall in an area ?*

3 *Give reasons to account for the following :*

(*a*) *Delhi is warmer than Bombay in summer.*

(*b*) *Mountains are colder than plains.*

(*c*) *The south-eastern coastal areas of India receive most of their rain in winter.*

(*d*) *India receives most of its rain in summer.*

4 *The sentence given below has several endings. Some endings make the sentence true. Others make it false. Place a tick mark (✓) before each true ending.*

We should study climate because it helps us to know

(*a*) *when and what kind of clothes we should put on.*

(*b*) *what kinds of books we should read.*

(*c*) *when to sow and when to reap crops.*

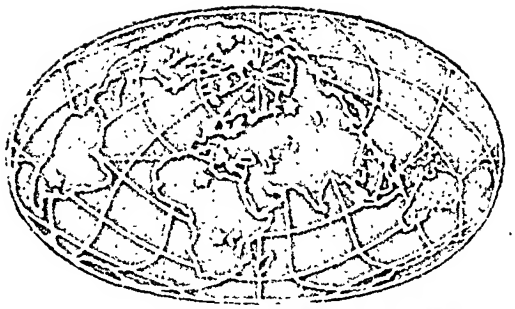
(*d*) *when to celebrate the Republic Day.*

(*e*) *what kind of crops we should grow.*

(*f*) *when and what kind of things we should eat.*

Things to do

Use the rainfall maps in Figure 14 *and list the three areas of our country that have the most rainfall during the summer monsoons. List the three areas that have the largest amount of rainfall during winter.*



LIFE OF PEOPLE IN DIFFERENT COUNTRIES OF THE WORLD

THERE are about 443 crore people living on the earth at present. As you know, all these people live in many different places on the earth's surface. Their homes are located in cold and warm regions, in both the eastern and western hemispheres.

Because of where people live, the way they live differs. But, even if they live in some far-off land, what they do basically is much the same as what we do. They build houses or grow and care for plants and animals. They make or buy clothing. They spend part of their time playing games or watching others play. They share their thoughts by talking to others, and by writing and painting.

When you read the next six chapters, you can learn how some people of our world do all these things. You will meet people who live in desert lands located in nearby countries as well as those who live in the cold land of far-away Greenland. You will learn about people living in the countries of Argentina and Canada. You will visit people who live in the hot-wet forests of Africa and those who live on the Japanese Islands.

You can learn many things about these people. The clothes they wear, their beliefs about God, the dances and games they enjoy and the way they use things provided by nature are all described in this Unit. Though it does not tell everything about these people, it tells enough for you to understand how the people live, and why they live as they do.

6 Desert Lands

Date-palm trees, camels, tents, people in long robes, and a never-ending view of sand—this is what comes to mind when someone thinks about the desert lands of the world. This, however, is only a part of the picture. Study the map in Figure 16. Note that the greatest deserts of the world are very long and wide.

There are great differences in the lands located within the desert area. The desert lands of the West Asia and North Africa have a number of mountains. Winter in these mountains is shiveringly cold. On the other hand, there are places that are warm throughout the year. Most of the desert land is dry, with less than twenty centimetres of rainfall during the year. The people have learned to live with very little rain.

Desert People

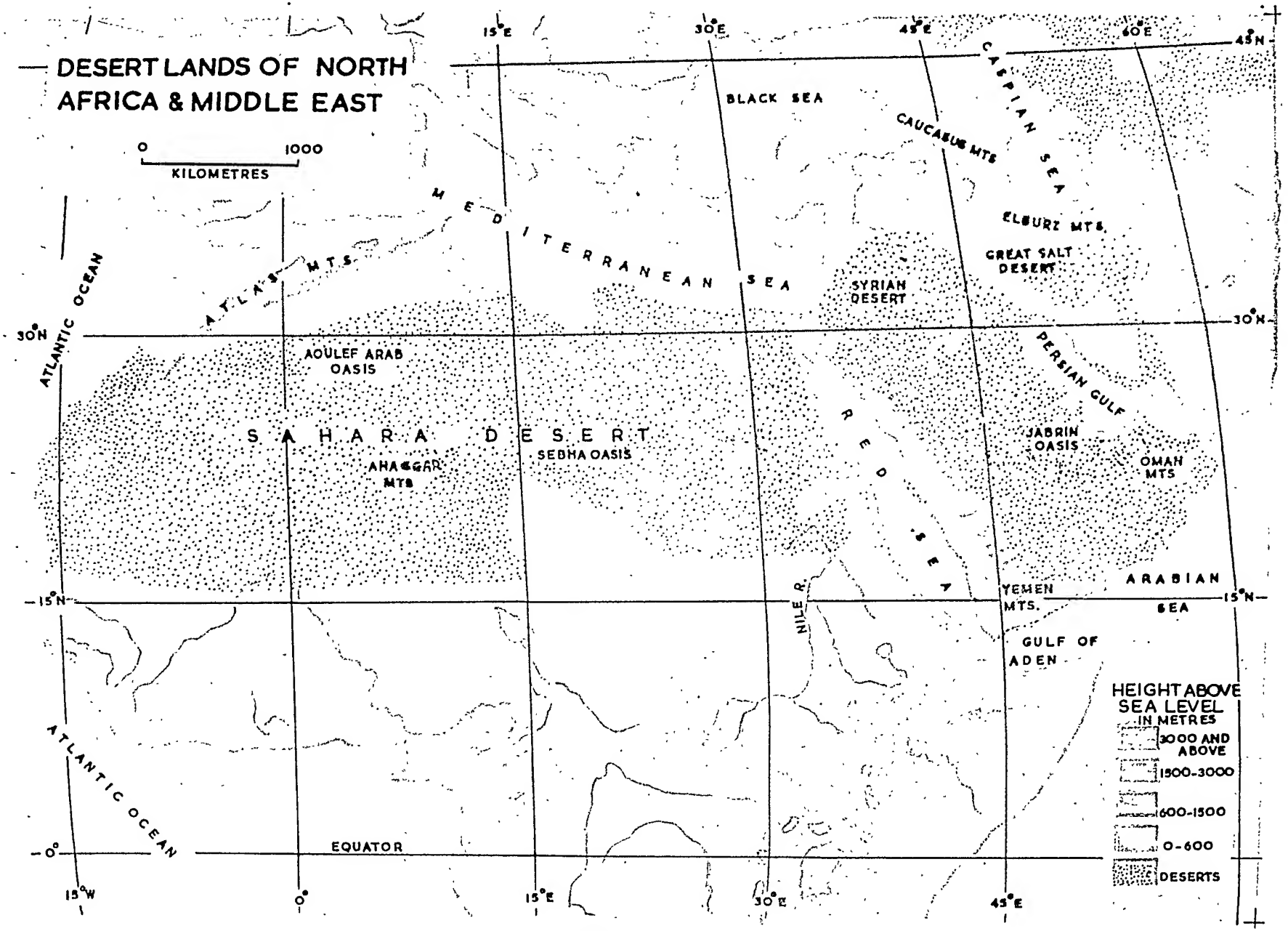
In our account of the way desert people live, we can divide them into three groups. One group is made up of the people who live in cities. Another group lives on farms. Most of the people in this group are located in places where water is available for irrigation. A third group of people have no permanent home. Instead of settling in one place, they move about quite often. People who do this are called, **nomads.**

Of the three groups, the nomads' life has probably changed least over the years. For this reason, most people want to learn more about the way they live. Below is a short story about Ali, an interesting boy living in one of the major deserts of this area. Read the story and decide whether you would like to live as Ali does.

Story of Ali

It was night in the desert. The only sound that could be heard was the movement of some animals—camels, sheep and goats—resting nearby a group of tents.

They were resting after a very tiring day of travel. Desert travel is ordinarily quite difficult. But yesterday's was more difficult than usual. Ali's family, and the others who travelled with them, came through a sand storm. For about three hours, the wind carried small particles of sand through the air. There was so much sand flying about that it was impossible to see more than a metre in front of you. Small hills of sand were actually shifted from one place


DESERT LANDS OF NORTH AFRICA & MIDDLE EAST
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45°E
60°E
45°N
30°N
15°N
0°
15°W
0°
15°E
30°E
45°E
BLACK SEA
CASPIAN SEA
CAUCASUS MTS
ELBURZ MTS.
GREAT SALT DESERT
SYRIAN DESERT
MEDITERRANEAN SEA
ATLANTIC OCEAN
ATLAS MTS.
AOULEF ARAB OASIS
SAHARA DESERT
AHAGGAR MTS
SEBHA OASIS
PERSIAN GULF
JABRIN OASIS
OMAN MTS
RED SEA
NILE R.
YEMEN MTS.
ARABIAN SEA
GULF OF ADEN
ATLANTIC OCEAN
EQUATOR
HEIGHT ABOVE SEA LEVEL IN METRES
3000 AND ABOVE
1500-3000
600-1500
0-600
DESERTS

Fig. 16

to another by the wind. Footprints and animal trails were completely covered. There was no way to determine the direction in which they were to go.

Ali and his family did what most desert travellers do during a sand storm. They took shelter behind the animals. Then when the storm stopped, they set up their tents and took rest.

On this particular night, Ali's father found it difficult to sleep. He was worried that yesterday's sand storm would make it difficult to find the correct trail. Finally he decided to leave the tent and look around.

It appears that these farmers in an oasis are seeing the tractor for the first time. In which part of India can you find trees like the ones seen in the picture.

When he came out of the tent, he found that the storm had actually changed the earth's surface. Sand-dunes (another name for hills of sand) had shifted from one place to another. All signs of a path or trail were gone.

Then Ali's father looked at the sky. He found the stars shinning brightly. He noted the position of some important stars and then was no longer worried. He could tell from their position the direction to travel the next morning. Desert travellers often find their way by observing the position of the moon, the sun or some important stars.

The morning after the storm, everyone was up early. They wanted to start their journey as soon as possible after daybreak. The early morning hours are the best time to travel. Later in the day, the temperature increases rapidly and travelling becomes uncomfortable.

Ali's mother hurried with breakfast. Camels and goats were milked. This milk along with dates, was served for breakfast. After breakfast Ali's mother and sisters started packing their belongings. Ali helped pull down the tents and then the men gave the signal for the camels to sit in a line. Leather and wooden seats were fixed on their backs. Bags containning their belongings and tents were placed on these seats. Leather bags full of water were hung on both sides of the camels.

Ali's father mounted the first camel in the line. Other members of the family sat on the other camels. As the camel on which Ali's father sat got up, the other camels also stood up. Slowly they started to move, one behind the other, in a single line. Travellers moving through the desert in this fashion are said to be travelling in a caravan.

As Ali's caravan travelled the sun's rays became very hot. Also, as the day passed the wind became hotter and stronger. By noon, it was so hot that Ali became uncomfortable. He took the loose end of the turban which covered his head and covered his face with it. This protected his face from the hot wind and blowing sand. The long robe he wore protected the rest of his body. During the night, his robe and turban would keep him warm.

After travelling some time, Ali saw some palm trees on the horizon. His father was certain there was water near those trees. When they reached the area covered by trees, the sun's rays were directly overhead. They were more direct and scorchingly hot. The caravan stopped and tents were set up. Ali's mother and sisters milked the animals and then prepared coffee

An Egyptian farmer working on the rich desert lands watered by the River Nile. Notice the dress of the farmer. It protects him from the hot rays of the sun.

and food. Everybody took lunch and felt refreshed.

Actually Ali's caravan had stopped in an area covered with palm trees and had wells located in several different places. Such an area in a desert is called an **oasis**.

People very often build a village in such places. The people of these oasis villages grow palm trees. Sometimes they cultivate wheat, cotton, grain and even maize. The fields in which these things grow are irrigated from the wells in the oasis.

In this village, Ali's father sold some blankets and carpets made by members of his family. He also delivered some goods which he had picked up at an oasis he visited two days ago. He was paid for carrying these goods and used the money to purchase things his family needed.

After staying at the oasis for a few days, Ali and his family were ready to move on. They had more goods to deliver to another oasis. Once again the process of preparing for a journey was begun. The camels were got ready. They are the desert travellers' most faithful servants. Without camels travel would be even more difficult. The camel can run on sand very easily. His body is not affected by sand and hot winds. And, most important, a camel can go without water or food for several days. This is important in deserts where water and food are difficult to find.

Before setting out on the journey all the leather bags were filled with water. The animals were given all

In the Middle East oil is transported through these pipe-lines to ports which are situated many kilometres away from the oil wells.

the water they wanted and the camels were loaded for the desert travel once again.

In the story you read that sometimes Ali's family went to a village and traded with the people who lived there. Ali was anxious to get things to eat which cannot be found in the desert. The nomad usually buys salt, rice, fruit, vegetables, spices and grain. He depends on the farmer for all these things. And the farmer in turn depends on the nomad. Each would have a more difficult life if one was not helped by the other.

Changes in Desert Life

Today more and more of the desert area is being irrigated. Farming is becoming more important. Some of the nomads are changing their ways. They no longer move about as they used to. They are becoming farmers-cum-herders. This is possible because there are times when the desert does provide some pasture. Sometimes rain falls in sudden showers. Seeds sprout and plants that looked dead begin to form leaves. For a short time, a part of the desert turns light green in colour. This is when the new farmers move with their animals from their home to the desert. Usually only the men travel. They may be gone for a few weeks or months. They return only when food is no longer available for their animals.

Many cities of the desert region are developing very rapidly. Most of

3. What will be the sign of the product if we multiply together
(i) 1 negative and 3 positive integers,
(ii) 2 negative and 5 positive integers,
(iii) 8 negative and 1 positive integers,
(iv) 21 negative and 1 positive integers.

4. Represent each of the integers -40, 16, -54, -68 and 0 as a product of two integers if one of them is -1.

5. Simplify: $(-8)\times[10-5-43+98]$

6. Compare the following:
(i) $(11+9)\times 10$ and $11+(9\times 10)$ (ii) $(41-3)\times 10$ and $41-(3\times 10)$

4.5 Division of Integers

Now that we have the rules for multiplication of integers, it is easy to draw rules for division of integers. Of course, as in the case of whole numbers, we will insist that **division by zero is not permitted.**

Let us recall that division is the inverse of multiplication. Therefore, to divide 18 by -6, for instance, we must ask, " By what should we multiply -6 to get 18? " Obviously, the answer is -3. Thus,

$$18\div(-6)=-3$$

Or, to divide -64 by 8, for instance, we must ask, " By what should we multiply 8 to get -64? " Obviously, the answer is -8. Thus,

$$(-64)\div 8=-8$$

Similarly, to divide -32 by -4, for example, we must ask, " By what should we multiply -4 to get -32? " Obviously, the answer is 8. Thus

$$(-32)\div(-4)=8$$

Thus we have the following **rules for division of integers:**

(a) **If the integers are of like signs, their quotient is positive;**

(b) **If the integers are of unlike signs, their quotient is negative.**

In each case, the absolute value of the quotient is found by dividing the absolute value of the dividend by that of the divisor.

Example 1: Divide 68 by -17

Solution: $|68|=68$, $|-17|=17$
On dividing the absolute value of the dividend by that of the divisor, we obtain $68\div 17$ o· 4. Now the integers are of unlike signs. Therefore, according to rule (b), the sign of the quotient is negative. Thus,

$$68\div(-17)=-4$$

Example 2: Divide -78 by 13.

Solution: $|-78|=78$, $|13|=13$ and $78\div13=6$. The integers are, again, of unlike signs. Therefore, the sign of the quotient is negative. Thus

$$(-78)\div13=-6$$

Example 3: Divide -324 by -9

Solution: $|-324|=324$, $|-9|=9$ and $324\div9=36$. The integers are of like signs. Therefore, by rule (a), the sign of the quotient is positive. Thus,

$$(-324)\div(-9)=36$$

EXERCISE 4.8

1. Find the quotient in each of the following:

(i) $36\div(-9)$ (ii) $-48\div(-16)$
(iii) $-24\div8$ (iv) $0\div(-7)$
(v) $-56\div(-4)$

2. Fill in the blanks:

(i) $\ldots\div(-11)=-3$ (ii) $\ldots\div7=-1$
(iii) $\ldots\div60=2$ (iv) $\ldots\div(-3)=-4$
(v) $\ldots\div(-5)=2$

3. Divide

(i) 10 by 10 (ii) 10 by -10
(iii) -10 by 10 (iv) -10 by -10

MISCELLANEOUS EXERCISE II

(On units III and IV)

1. Rewrite the following using the symbols '$<$' or '$>$'.
(i) -7 is greater than -17 (ii) 10 is positive
(iii) -3 is negative (iv) -3 is less than 3

2. The product of two integers is -1. Find the integers.

3. Write down the following as a product of two integers, one of which is -1
(i) 5 (ii) -13 (iii) 9
(iv) -1 (v) 1 (vi) 0

4. Explain the meaning of $|-3|$ and $-|3|$.

5. Simplify:
(i) $-|4|+|-4|-|-4|$
(ii) $|(-4)\times(-2)|+|-4|-|-2|$

6. If the temperature is $-4°C$ and it rises $20°C$, determine the new temperature.

7. Find $0\div 3$, $0\div(-3)$, $0\div 162$, $0\div(-162)$
[*Hint* : $0\times 3=0$, etc.]
(We will note that **zero divided by any non-zero integer is always zero.**)

8. Complete the following:
(i) To subtract -15 means, to add ....
(ii) To subtract 16 means, to add ...

9. Fill in the blanks:
(i) $(-8)+(-5)=(-8)-(\ldots)$
(ii) $7+5=7-(\ldots)$
(iii) $9+(\ldots)=9-(-6)$
(iv) $(-9)-(+6)=(-9)+(\ldots)$

10. Simplify:
(i) $18-(3)(12)\div 6$
(ii) $-20+(-60)\ (5)\div(-10)$
(iii) $36\div(-3)+12$

11. Find the unit's digit in each of the following:
(i) $17\times(-27)\times 37\times 22$
(ii) $12\times 25\times(-16)\times(-13)$
(iii) $16\times(-26)\times(-36)\times(-46)$

12. In a true-false test consisting of 50 questions, a student is given 2 marks for every correct answer and -1 for every wrong answer. He gets a 0 for no answer.

(a) A student gives 32 correct and 14 wrong answers and does not attempt 4 questions. How many marks will he obtain?

(b) What will be the number of marks of a student who answers 25 questions correctly and 25 incorrectly.

13. Find:

(i) $(-3)\times[5+(-8)+9]-[4\times\{9+8+(-7)\}]$

(ii) $[(-6)\times(9-12)]+[(-8+15)\times(-15)]$

(iii) $(-7)\times[(-5)+8(43-57)]$

(iv) $[(-15)\times(48-43+18-10-11)]+[(37-45)\times(-15)]$

14. Let us invent an operation ' * ' (for the integers) to mean 'add the integers and to the sum, add their product'. In other words, if a and b are any two integers,

$$a*b=a+b+ab$$

Thus $2*3=2+3+6=11$, $2*(-3)=2+(-3)+(-6)=-7$
$0*4=4$, etc.

(a) What does $4*5$ mean? $0*3$? $(-3)*0$?
$(-2)*(-1)$?

(b) Is $2*3=3*2$?

***15.** A frog, who falls in a well, 8 m deep, tries to jump out of it. Every time, the frog jumps 70 cm upwards, he falls back 20 cm. What is the net result of one jump? How many jumps would the frog need to get out of the well?

UNIT V

POWERS OF INTEGERS

We study, in this unit, squares, cubes and higher integral powers of integers. We also learn how to find square roots of positive integers, that are perfect squares.

5.1 Powers of Integers

When an integer is multiplied with itself, we get what we call the **second power** or **square** of the integer. For example, 3×3 is the square of 3 and is written as 3^2. We read 3^2 as the '**second power of 3**' or '**square of 3**' or '**3 raised to the exponent 2**' (or simply, '**3 raised to 2**') or '**3-squared**'. Of course, $3^2=9$

Similarly, $(-5)^2=(-5)\times(-5)=25$

And, $10^2=10\times10=100$

The raised numeral is called the **exponent** or **index.** (We will **prefer** to use the word '**exponent**') Writing 3×3 in the form 3^2 is referred to as writing in **exponential notation** or **power notation.**

When an integer appears three times in a product, we get what we call the **third power** or **cube** of the integer. For example, $2\times2\times2$ is the cube of 2 and is written as 2^3. We read 2^3 as the '**third power of 2**' or '**cube of 2**' or '**2 raised to (the exponent) 3**' or '**2-cubed**'. Thus,

$$2^3=2\times2\times2=8$$

Similarly, $(-6)^3=(-6)\times(-6)\times(-6)=-216$

$7^3=7\times7\times7=343,$

And, $10^3=10\times10\times10=1000$

Higher powers of an integer can be thought of as above. For instance,

Fourth power of 2 or **2 raised to 4**$=2^4=2\times2\times2\times2=16$

Fourth power of $-3=(-3)^4=(-3)\times(-3)\times(-3)\times(-3)=81$

-5 **raised to 4**$=(-5)^4=(-5)\times(-5)\times(-5)\times(-5)=625$

10 raised to 4$=(10)^4=10\times10\times10\times10=10000$

Fifth power of 2 or **2 raised to 5**$=2^5=2\times2\times2\times2\times2=3$

Fifth power of $-3 = (-3)^5 = (-3)\times(-3)\times(-3)\times(-3)\times(-3)$
$= -243$

-5 raised to 5 $= (-5)^5 = (-5)\times(-5)\times(-5)\times(-5)\times(-5)$
$= -3125$

10 raised to 5 $= (10)^5 = 10\times10\times10\times10\times10 = 100000$

The use of the exponential notation helps us to write large numbers concisely and elegantly. Do you recall using the powers of 10 in the place-value concept?

It is easy to verify that

$(-1)^{\text{odd positive integer}} = -1$

$(-1)^{\text{even positive integer}} = +1$

If a is an integer, a^2 is also an integer and is called a **perfect square.** First five non-zero perfect square integers are $1^2=1$, $2^2=4$, $3^2=9$, $4^2=16$ and $5^2=25$. What are the next two perfect square integers?

Again, if a is an integer, a^3 is also an integer and is called a **perfect cube.** First five positive perfect cube integers are $1^3=1$, $2^3=8$, $3^3=27$, $4^3=64$ and $5^3=125$. What are the next two perfect cube integers?

We may similarly find perfect fourth powers, perfect fifth powers, etc. of integers.

EXERCISE 5.1

1. For each of the following, write the numeral that appears in the exponent

(i) $(20)^8$ (ii) $(-7)^6$ (iii) 23
(iv) $(-5)^2$ (v) $(-1)^{444}$

2. Find

(i) The square of 16 (ii) The cube of -4
(iii) The square of -14 (iv) The fourth power of 3

3. Write, using exponential notation:

(i) 7 (ii) $(-3)\times(-3)\times(-3)\times(-3)\times(-3)\times(-3)\times(-3)$
(iii) $10\times10\times10\times10\times10\times10\times10\times10$ (iv) -26

4. Find

(i) 50^2 (ii) 4^3 (iii) 3^6 (iv) $(-1)^{20}$
(v) 1^{16} (vi) $(-1)^{63}$ (vii) 1^{97} (viii) $(-2)^5$
(ix) 2^5 (x) 2^{10}

5. Simplify:

(i) $2^3\times3^2$ (ii) $(-2)^2\times(-3)^3$

(iii) $(-1)^3 \times (-10)^2$ (iv) $2^3 \times (-3)^2 \times 8$
(v) $(5)^2 \times (10)^2 \times (-1)^3$ (vi) $(-5)^3 \times (-2)^3$
(vii) $(3)^2 \times (10)^4 \times (-1)^{10}$ (viii) $(-2)^4 \times (-3)^3 \times (-1)$

6. Find the cubes of the following:
(i) -12 (ii) -25 (iii) -9
(iv) 100 (v) 20

7. Find the squares of first ten natural numbers. Observe their unit's digits. What do you note?

8. Find the cubes of first nine natural numbers.

9. Find: 10^2, 20^2, 30^2, 100^2, 200^2, 1000^2
(We will note that **the number of zeros to the right in the square of an integer is twice the number of zeros to the right in the integer.**

5.2 Square Roots

We have seen in Section 5.1 that the square of an integer is the result of multiplying an integer with itself. The inverse process, namely, finding an integer whose square yields the given integer is called the process of '**unsquaring**' or **finding the square root of an integer.** For example, to find the square root of, say, 16, we need to find an integer whose square is 16. Obviously, such an integer is 4 or -4. Each is called a square root of 16.

(In this unit, **we will confine ourselves to finding square roots of perfect squares only.** Further, **we will look for only the positive square root** since the other can then be easily written down. And, in this case we will speak of the **square root.** For the positive square root, we use the symbol $\sqrt{}$. For example, we write $\sqrt{16}=4$ and $\sqrt{16}=-4$.

Example 1: Find the square root of 49

Solution: We know that $7^2=49$. Thus, $\sqrt{49}=7$

Example 2: Find the square root of 625

Solution: $625=5\times5\times5\times5$ or 25×25. Thus, $\sqrt{625}=25$

Example 3: Find the square root of 1764

Solution: Just off hand, we cannot say, what is the integer whose square is 1764. Thus, we find the factors of 1764. We note

$$1764=2\times2\times3\times3\times7\times7$$

$$=2^2\times3^2\times7^2$$

Thus, $\sqrt{1764}=2\times3\times7=42$

2	1764
2	882
3	441
3	147
7	49
	7

We observe that

To find the square root of a perfect square, we

(a) **find the factors of the given integer,**

(b) **for each pair of factors of the given integer, we select one factor to be included in the square root,** and

(c) **multiply the factors selected, if necessary.**

This method is, for obvious reasons, called the **factor method.**

Incidentally, this gives us a method to decide whether or not a given integer is a perfect square. If there is a factor of the given integer, which does not occur in a pair, it is obvious that the given integer is not a perfect square.

Example 4: Find the two square roots of 1089

Solution: We note that

$1089 = 3^2 \times 11^2$

$$\begin{array}{r|l} 3 & 1089 \\ \hline 3 & 363 \\ \hline 11 & 121 \\ \hline & 11 \end{array}$$

Thus a square root of 1089 is 3×11 or 33.

Other square root is, therefore, -33.

A **cube root** of an integer is an integer whose cube is the given integer. How will you define the **fourth root** of an integer? **Fifth root?** (The study of cube roots, fourth roots, fifth roots, etc. is beyond the scope of this book. We shall confine ourselves to finding square roots only.)

EXERCISE 5.2

1. Find the square root of each of the following:

(i) 100 (ii) 256 (iii) 225 (iv) 169
(v) 196 (vi) 324 (vii) 10000 (viii) 676
(ix) 1000000

2. Give the values of $\sqrt{289}$, $\sqrt{400}$, $\sqrt{3600}$ and $\sqrt{784}$.

3. Decide which of the following are perfect squares:
7, 121, 144, 18, 11025

4. Since $0 \times 0 = 0$, we write $0^2 = 0$ and say that the square of zero is zero.
What is the square root of zero?

UNIT VI

PROPERTIES OF WHOLE NUMBERS

In earlier units, we studied the properties of operations on whole numbers and integers. We will now investigate certain interesting properties of numbers, in particular, whole numbers. We will also study the rules for divisibility of numbers by 2, 3, 4, 5, etc.

6.1 Factors and Multiples

We already know what a **factor** of a number is. In fact, we have used this concept in finding the square roots of perfect square integers in Section 5.2.

Let us also recall that **a number which is (exactly) divisible by 2 is called an *even* number.** Some examples of even numbers are 0, 2, 4, 6, etc. **A number which is not (exactly) divisible by 2 is called an *odd* number.** Examples of odd numbers are 1, 3, 5, 7, etc. We note that if a number divided by 2 yields a remainder of 1, the number is odd. (Why?)

Consider the number 12. We can write, for instance, that $12=3\times4$. We say 12 is a **multiple** of 3. 12 is also a **multiple** of 4. Among the whole numbers, there are other multiples of 3. For instance, 0, 3, 6, 9, 15, 18, 21, etc. Similarly, there are other multiples of 4. For instance, 0, 4, 8, 16, 20, 24, 28, etc. What do you observe? Is it not a fact that when you learnt your multiplication tables, you were indeed learning the successive multiples of various numbers?

EXERCISE 6.1

1. **(Review question):** List all the factors of 60
   [Note that 1 and 60 are also factors.]
2. (a) Begin counting from 1 and count by 2's.
   What kind of numbers do you get?

(b) Begin counting from 0 and count by 2's.
What kind of numbers do you get?
[Observe that even numbers are multiples of 2.]

(c) Begin counting from 0 and count by 4's.
What kind of numbers do you get?

3. Fill in the blanks:
(i) 343 is a multiple of 7; therefore, 7 is a ... of 343.
(ii) 27, 36, 45, 54 and 63 are all multiples of ... and also of ....
(iii) The factors of 76 are .....

4. We want to put 30 chairs in a room with each row having the same number of chairs. Is there only one way? How many rows can we have?

6.2 Prime and Composite Numbers

What are the factors of 3? 5? 7? 11? We observe that in each of these examples, the **only** factors are 1 and the number itself. Such numbers are called **prime numbers.** Some more examples of prime numbers are 13, 17, 19, 23, etc. Thus

A number is *prime* if its only factors are 1 and itself; otherwise, the number is *composite*.

Some examples of composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, etc. **1 is neither prime nor composite.**

We note that 2 is the least (or smallest) prime. In fact, **2 is the only prime number that is even.**

How can we list all the prime numbers between, say, 1 and 100? Eratosthenes (274 B.C.—194 B.C.), a Greek mathematician and astronomer, gave a simple method to sort (sift) out primes. His method is known as the **Sieve of Eratosthenes;** however, we will call it simply the **Sieve method.**

We first list the numbers from 1 to 100 in 10 rows of 10. We strike off 1. (Why?)

The number 2 is prime. Thus, we keep 2. However, we strike off all the multiples of 2 beginning with 4 [In practice, we strike off every **second** number beginning with 4.]

Next, the number 3 is prime. Thus we keep 3. However, we strike off all the multiples of 3 beginning with 6. [Again, we will strike off every **third** number beginning with 6. We will observe that some of the numbers are already struck off. (Why?)]

SIEVE OF ERATOSTHENES

~~1~~	2	3	~~4~~	5	~~6~~	7	~~8~~	~~9~~	~~10~~
11	~~12~~	13	~~14~~	~~15~~	~~16~~	17	~~18~~	19	~~20~~
~~21~~	~~22~~	23	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	29	~~30~~
31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	37	~~38~~	~~39~~	~~40~~
41	~~42~~	43	~~44~~	~~45~~	~~46~~	47	~~48~~	~~49~~	~~50~~
~~51~~	~~52~~	53	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	59	~~60~~
61	~~62~~	~~63~~	~~64~~	~~65~~	~~66~~	67	~~68~~	~~69~~	~~70~~
71	~~72~~	73	~~74~~	~~75~~	~~76~~	~~77~~	~~78~~	79	~~80~~
~~81~~	~~82~~	83	~~84~~	~~85~~	~~86~~	~~87~~	~~88~~	89	~~90~~
~~91~~	~~92~~	~~93~~	~~94~~	~~95~~	~~96~~	97	~~98~~	~~99~~	~~100~~

Now the multiples of 4 have already been struck off, since 4 is also a multiple of 2.

Next, 5 is prime. We keep 5 and strike off every **fifth** number beginning with 10.

We continue in the manner keeping only the successive primes and striking off their multiples until we cannot strike off any more numbers.

When will we not be able to strike off any more numbers? We note that after we strike off the multiples of 7, we will not be able to strike off any more numbers. (Why?)

Thus the prime numbers from 1 to 100 are:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Eratosthenes, perhaps, made holes in the paper instead of striking off numbers. Therefore, his paper must have looked like a sieve (छलनी). It is probably for this reason why this method is called the Sieve method.

We observe that the successive primes do not display any pattern. Mathematicians, for centuries, have tried to devise or invent formulae which will give all the primes. They have been unsuccessful. The only way to find prime numbers is to test each number and see whether or not it has factors, other than 1 and itself. Of course, with the coming of computers, we have been able to test larger and larger numbers. Do you know that the 39-digit number

170141183460469231731687303715884105727

is prime? The computer is continuing to search for larger prime numbers.

EXERCISE 6.2

1. State an even number which is prime.

2. Can a composite number be odd? If yes, which is the smallest?

3. In the list of prime numbers less than 100, we note that the primes in the pair 3, 5 differ by 2. Similarly, the primes in the pairs 5, 7; 11, 13 also differ by 2. Such pairs of prime numbers are called **twin primes.**

List all the twin primes less than 100.

4. Note that we can write $6=3+3$, $8=3+5$, $10=3+7$ or $5+5$, $12=5+7$, etc. We observe that these are even numbers, each written as sum of two odd primes. Write 14, 16, 18, 20, 22, 24, 30 and 56 as sums of two odd primes.

[In 1742, a mathematician by the name of Goldbach wrote, in a letter to a friend, that he had a conjecture (guess) to which he could not provide a proof. Goldbach conjectured that

Every even number greater than 4 can be expressed as a sum of two odd primes.

His friend could not supply a proof either. In fact, no mathematician has been able to supply a proof to the above or prove that Goldbach is wrong by finding just one example where his conjecture does not hold. It still remains as an unsolved problem in mathematics and is called **Goldbach's conjecture.**]

5. Which of the following are primes?

(i) 957 (ii) 139 (iii) 204

6. Write seven consecutive numbers, each of which is composite and less than 100.

6.3 Prime Factorizations

We already know about factors and primes. For instance,

$12 = 3 \times 4$ or $3 \times 2 \times 2 = 3 \times 2^2$

$15 = 3 \times 5$

$24 = 2 \times 12$ or 3×8 or 4×6 or $2 \times 2 \times 2 \times 3 = 2^3 \times 3$

We observe that there may be several factorizations of a number. Further, that in the factorization $3 \times 2 \times 2$ of 12, each factor is prime. Similarly, in the factorization $2 \times 2 \times 2 \times 3$ of 24, each factor is prime. Such factorizations are called **prime factorizations.** In other words,

A factorization is prime if all the factors are prime.

We note, that we can start with any factorization and end up with a prime factorization. For example,

$112 = 7 \times 16 = 7 \times 2 \times 2 \times 2 \times 2$

Or, $112 = 8 \times 14 = 2 \times 2 \times 2 \times 2 \times 7$

Or, $112 = 28 \times 4 = 7 \times 2 \times 2 \times 2 \times 2$

We also notice that in each of the prime factorizations, the factors may be arranged differently but in fact, the **prime factorization is unique.** This property, namely, **every composite number has only one prime factorization** is called the **Prime Factorization Property** or the **Fundamental Theorem of Arithmetic.**

(A proof of this property is beyond the scope of this book.)

EXERCISE 6.3

1. Factorize the following in more than one way:
   54, 62, 72
2. Find the prime factorizations of the following:
   90, 108, 9000, 221, 7325, 8712, 13915
   (Use exponential notation where possible.)
3. Write the smallest 3-digit number and express it as a product of primes.

6.4 Tests for Divisibility of Numbers

So far the only way that we know to find whether or not a number is divisible by, say, 2 or 3 or 5 or 9 is to divide the number by 2 or 3 or 5 or 9

and see if any remainder is left. This is both time consuming and unnecessary. Much easier methods are available to test whether or not a number is divisible by certain other numbers.

6.4.1 Let us, for instance, write the multiples of 10. They are 0, 10, 20, 30, 40, 50, etc. What do we observe? Each of the number ends in a '0'. Immediately, we get a **criterion (rule)** to test whether or not a number is divisible by 10.

A number is divisible by 10 if it ends in a '0'.

6.4.2 How about divisibility by 5? Let us look at the multiples of 5. They are 0, 5, 10, 15, 20, 25, 30, 35, etc. Each of the number ends in a 0 or 5. So, we say,

A number is divisible by 5 if it ends in a '0' or '5'.

6.4.3 It is, of course, easy to tell whether or not a number is divisible by 2? Simply that the number has to be even. Now, how do even numbers look like? They are 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, etc. Can you, now, make up a divisibility test for 2?

A number is divisible by 2 if it ends in a 0 or 2 or 4 or 6 or 8. In fact, we can do better. We can simply say that

A number is divisible by 2 if it ends in an even digit.

Before considering other divisibility tests, we learn an interesting property.

6.4.4 316 is divisible by 2 and so is 108. How about their sum? $316+108=424$ which ends in an even digit and, therefore, according to the divisibility test, the sum is divisible by 2. Is the difference divisible by 2?

3165 is divisible by 5 and so is 2625. How about their difference? $3165-2625=540$. Now 540 ends in a zero and again, according to the divisibility criterion, the difference is divisible by 5. Is the sum divisible by 5?

In fact, it is easy to prove that **the sum and difference of numbers divisible by a certain given number must also be divisible by the given number.** However, the proof is beyond the scope of this book and will be taken up at a later stage.

6.4.5 We will, now, discover divisibility tests for 3 and 9. Let us consider, for instance, the number 5871 and try to decide whether or not it is divisible by (i) 3, (ii) 9.

We write 5871 in expanded notation, namely,

$5871=5\times1000+8\times100+7\times10+1\times1$

Now, $10=9+1$, therefore, $7\times10=7\times(9+1)=7\times9+7$, because of the distributive property.

Similarly, $8\times100=8\times99+8$

And, $5\times1000=5\times999+5$

Thus, $5871=(5\times999+5)+(8\times99+8)+(7\times9+7)+1$

Now, 9, 99, 999 etc. is each divisible by 3 and also by 9. Thus, 5871 will be

(i) divisible by 3, if $5+8+7+1$ is divisible by 3.

(ii) divisible by 9, if $5+8+7+1$ is divisible by 9.

But what is $5+8+7+1$. It is the sum of the digits of the given number. We say,

A number is

(i) **divisible by 3, if the sum of its digits is divisible by 3,**

(ii) **divisible by 9, if the sum of its digits is divisible by 9.**

We note that 5871 is divisible by 3 but not by 9.

Example 1: Determine whether or not 267525 is divisible by (i) 3, (ii) 9.

Solution: Sum of the digits in the given number is $2+6+7+5+2+5=27$ which is divisible by both 3 and 9.

Thus the number itself is divisible by 3 and by 9.

6.4.6 We will now discover the rules for divisibility by 4 and 8. We know that 1 and 10 are not divisible by 4 but 100, 1000, 10000, etc. are. Let us now consider a number, say, 4728. We write,

$$4728=4\times1000+7\times100+2\times10+8\times1$$

Since 1000 and 100 are divisible by 4 but 10 and 1 are not, it is clear that the number 4728 will be divisible by 4 if $2\times10+8\times1$ is divisible by 4.

But what is $2\times10+8\times1$? It is 28 or the last two digits (in the unit's and tens' place) in the number. We say,

A number is divisible by 4 if the number formed by its last two digits (in the order of the digits) is divisible by 4.

We note that 4728 is divisible by 4.

We leave it as an exercise for the student to verify that

A number is divisible by 8 if the number formed by its last three digits (in the order of the digits) is divisible by 8.

Example 2: Is 12504 divisible by 8?

Solution: The number formed by its last three digits is 504, which is divisible by 8. Thus, 12504 is divisible by 8.

MISCELLANEOUS EXERCISE III

(On Units V and VI)

1. Find the value of:
10^4, 26^2, 101^2, $(-11)^3$, 9^5, $(-1)^{123}$, $(-1)^{462}$

2. Find the square root of:
441, 15625, 1024

3. Write all the multiples of 12 less than 90.

4. Find the prime factorization of 8025.

5. Identify which of the following are primes:
112, 323, 151, 135

6. Find the prime numbers between 100 and 110.

7. Find the prime factorization of 819, 3105, and 153549.

8. We know that an even number is divisible by 2. In other words, we can express an even (whole) number as twice some whole number. Using symbols, we write

$$a=2m$$

where 'a' denotes an even number and 'm' any whole number. Thus, we can write, for instance, $8=2\times4$ or $612=2\times306$.

Write the following in the above form:
16, 234, 0, 82

9. Since an odd number, when divided by 2, always leaves a remainder of 1, we can write an odd number, say 'a', as

$$a=2m+1$$

where m is a whole number. For instance,
$1=2\times0+1$, $7=2\times3+1$, $981=2\times490+1$

Write the following in the above form:
5, 19, 325, 6081

10. A number which is equal to the sum of all its factors, including 1 but excluding itself, is called a **perfect number.** For instance 6 is a perfect number, since $6=1+2+3$. There is one other perfect number less than 40. Find it.

11. The number 4 can be shown in a dot pattern consisting of 2 rows of 2 dots each, 9 in 3 rows of 3 dots each, 16 in 4 rows of 4 dots each. (See Fig. 6.1) Such numbers are called **square numbers.**

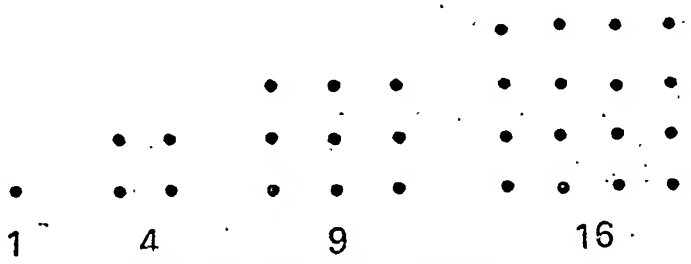

Fig. 6.1: Square numbers

(Can you recall another name for these numbers?) Make a dot pattern for the next two square numbers.

12. (a). Verify that $(2\times3\times4\times5)+1$ is a perfect square.
(b) Verify that $(8\times9\times10\times11)+1$ is a perfect square.
(c) Select any four consecutive natural numbers. Multiply them together and add 1 to the product. Verify that the result is a perfect square.

13. Pythagoras was a mathematician in the ancient Greece. His date and place of birth are both unknown. However, it is estimated that he was born between 580 and 568 B.C. He founded a secret mathematical school and made many contributions to mathematics. The members of this school are known as Pythagoreans. The Pythagoreans called the numbers 1, $1+2=3$, $1+2+3=6$, $1+2+3+4=10$, $1+2+3+4+5=15$, etc. as **triangular numbers.** These numbers can be shown in triangular dot patterns as in figure 6.2.

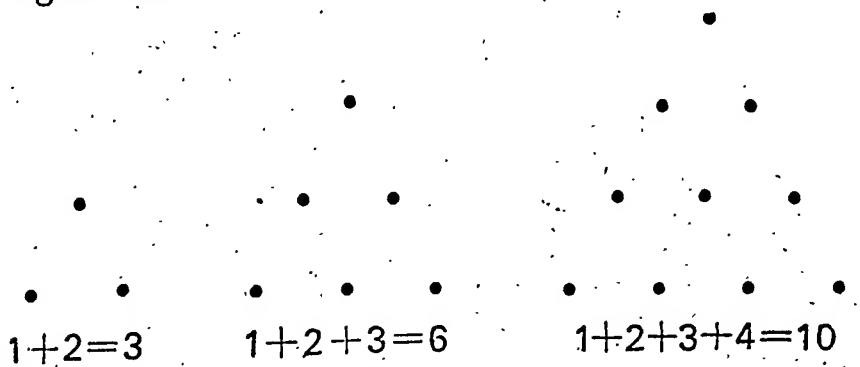

Fig. 6.2: Triangular numbers

Write the next four triangular numbers and make dot patterns for each of them.

14. If any two adjacent triangular numbers are added, we get a square number. For instance, $1+3=4=2^2$, $3+6=9=3^2$, $6+10=16=4^2$, etc. (See Fig. 6.3).

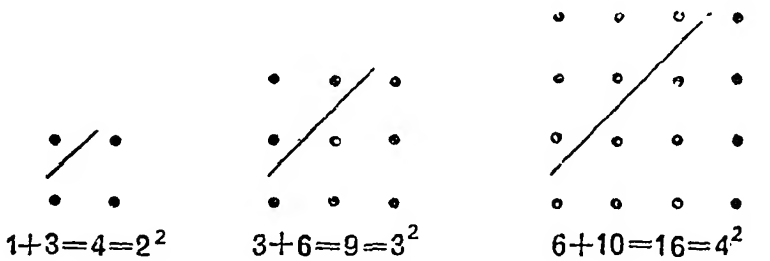

Fig. 6.3

(i) What is the sum of the 4th and 5th triangular numbers?
(ii) What is the sum of the 5th and 6th triangular numbers?
(iii) Can you give the sum of 27th and 28th triangular numbers?

UNIT VII

ALGEBRAIC EXPRESSIONS WITH INTEGRAL COEFFICIENTS

We have already used letters to represent numbers, for instance, in stating the properties of operations on whole numbers or integers. We will now make a systematic transition from arithmetic to algebra, in this unit. We will learn how to use these letter-numbers—to add, subtract and multiply them.

7.1 From Arithmetic to Algebra

A great German mathematician, Felix Klein (1849-1925), once said "real mathematics begins with operations with letters." We have already used letters to denote numbers in this book and in our earlier classes. Do you recall, for instance, that to write a formula for the area of a rectangle, we used letters, such as A, l, w and wrote $A=l\times w$? In this formula, A denotes the (number of units of) area, l the (number of units of) length and w the (number of units of) width of the rectangle. The introduction of these letters helps us to think in more general terms. With $A=l\times w$, we can compute the area of **any** rectangle. For instance, a rectangle whose l is, say, 12 cm and w, say, 8 cm, we **substitute** these values of l and w in $A=l\times w$ and compute the area. **The letters A, l, w, simply, denote numbers.** This use of letters to represent numbers to be able to think in general terms, is the transition from arithmetic to algebra.

We will call these letters as **literal numbers,** for obvious reasons. Since they represent numbers, it is clear, that they **must obey all the rules (and signs) of addition, subtraction, multiplication and division of numbers as well as the properties of these operations.**

A number or a combination of numbers using the fundamental operation(s) is called an **algebraic expression.** Some examples of algebraic expressions are $y-3x$, $a+b-c$, $4pq-4qr-4rs+4st$, 23, $2y$, $5n$, lwh, etc. When two or more of the signs '$+$', '$-$' appear, the expression is separated into several parts. Each part along with its sign is called a **term.** Often, the plus sign of the first term of an expression is omitted: y, $-3x$ are the terms of the expression $y-3x$; a, b, $-c$ are the terms of $a+b-c$.

When an expression consists of only one term, it is called a **monomial.** 23, $2y$, $5n$, lwh, $4s$, etc. are examples of monomials. An expression containing two terms is called a **binomial***. Some examples of binomials are $y-3x$, $23-z$, $2l+2w$, etc. What is a **trinomial?** Can you tell? Give some examples of trinomials.

In a term, $18xy$, for instance, 18, x and y are called the **factors** of the term. x and y are **literal factors;** 18 is a **numerical factor.** Any one of these factors is called the **coefficient** of the product of the remaining factors. Thus, y is the coefficient of $18x$ in the term $18xy$, $-q$ is the coefficient of $4r$ in the term $-4qr$, 18 is the coefficient of xy in the term $18xy$. We, sometimes, also refer to the numerical factor as the **coefficient of the term.** Thus, 18 could also be called the coefficient of the term $18xy$. When the coefficient of a term is $+1$ or -1, the '1' is usually omitted. For instance, we write $1x$ as x and $-1x$ as $-x$.

When the terms have the same literal factors, they are called **like terms;** otherwise, they are **unlike terms.** For example, in the expression, $2xy-3x+7xy+4x$, $2xy$ and $7xy$ are like terms; $-3x$ and $4x$ are like terms. However, the terms in the expression $a+b-c$ or $y-3x$ or $4pq-4qr-4rs+4st$ are unlike terms.

EXERCISE 7.1

1. State which of the following are monomials, which binomials and which trinomials. Suggest a name for the others.

(i) $4x-3y$ (ii) x^3 (See Note below)
(iii) $4p^2q-4qp^2+r$ (iv) $3abc$
(v) $x+y+z+w$ (vi) $7-x+y$
(vii) $5x^3-2x+4$

2. In the following, which pairs contain like terms?

(i) $3x$, $-7x$ (ii) $11x$, $11y$
(iii) $14xy$, $-21xy$ (iv) $15ab$, $-4b$

3. Write the coefficient of x in each of the following expressions:
$-3xy$, $4x-3y$, $7-x+y$, mx, $17xyz$

---

*'Bi' means '2'; **binomial,** therefore, means **two terms.** 'Tri' means '3'; **trinomial,** therefore, means **three terms.** **Monomial** means **one term.**

Note: We are already familiar with the notation for squares, cubes and higher powers of numbers. Since, these letters also denote numbers, the same notation can be conveniently used in case of these numbers as well. Thus, $x^2=x\times x$, $x^3=x\times x\times x$, etc.

7.2 Addition and Subtraction of Algebraic Expressions

We now know that an expression may consist of like and unlike terms. In adding (or subtracting) algebraic expressions, therefore, we must **collect** and **add (or subtract)** like terms. Now, how do we add (or subtract) like terms? Consider, for instance, $3x$ and $7x$. Suppose we wish to find $3x+7x$. Can we not write

$$3x+7x=(3+7)x?$$

Yes! (Why?) Do you recall the distributive property?

Thus, $3x+7x=(3+7)x=10x$

Similarly, $18xy-3xy+6xy=(18-3+6)xy=21xy$

What is, therefore, **the rule for adding (or subtracting) like terms?**

The sum (or difference) of several like terms is another like term whose coefficient is the sum (or difference) of the coefficients of several like terms.

Example 1: Add $3pq$, $-2pq$ and $-11pq$

Solution: The sum will be another like term with the coefficient $3-2-11=-10$. Thus

$$3pq-2pq-11pq=-10pq$$

Alternatively, if we do not wish to remember the rule, we can remind ourselves of the distributive property and write

$$3pq-2pq-11pq=(3-2-11)pq=-10pq$$

Example 2: Subtract $24ab^2$ from $8ab^2$

Solution: $8ab^2-24ab^2=(8-24)ab^2=-16ab^2$

Example 3: Collect like terms and simplify the expression

$$-7x^2+3x+x^2-8-5x+9x^2-4$$

Solution: We rearrange and collect like terms.

We get $-7x^2+x^2+9x^2+3x-5x-8-4$

$=(-7+1+9)x^2+(3-5)x-12$

$=3x^2-2x-12$

Example 4: Add the expressions $3x+4y-5z$, $5y+2x$, $7x-8y$ and $4x-9y-5z$

Solution: To find the sum of the expressions, we need to add their like terms. For the sake of convenience, we will write the expressions so that their like terms are in a column* as below:

$$\begin{array}{r} 3x+4y-5z \\ 2x+5y \\ 7x-8y \\ 4x-9y-5z \\ \hline 16x-8y-10z \end{array}$$

*For this purpose the order of the terms in the expression(s) may be changed, if necessary, as in the case of the second expression in Example 4 above.

Example 5: Subtract $12xy-5yz-9zx$ from $15xy+6yz+7zx$

Solution:
$$\begin{aligned}&15xy+6yz+7zx-(12xy-5yz-9zx)\\&=15xy-12xy+6yz-(-5yz)+7zx-(-9zx)\\&=(15-12)xy+[6-(-5)]yz+[7-(-9)]zx\\&=3xy+11yz+16zx\end{aligned}$$

[Recall that negative of a negative number is positive; i.e., $[6-(-5)]=6+5$ or 11, etc. What is the negative of a positive number? Can we, therefore, not say that **to subtract an expression from another, we change the sign (from '+' to '−' or from '−' to '+') of each term in the expression which is to be subtracted and then add the two expressions**? We will place like terms in a column, as in Example 4 above. **The change of sign of every term in the expression to be subtracted is indicated below the original sign of the term.**]

We now subtract $12xy-5yz-9zx$ from $15xy+6yz+7zx$ by this method:

$$\begin{array}{rrrr} & 15xy & +\ 6yz & +\ 7zx \\ & 12xy & -\ 5yz & -\ 9zx \\ - & + & + & \\ \hline & 3xy & +11yz & +16zx \\ \hline \end{array}$$

Example 6: From the sum of $3x^2-8x+11$, $-2x^2+12x$ and $-4x^2+17$, subtract x^2-x-1.

Solution: We write the expressions so that their like terms are in a column, of course, changing the sign of each term in the last expression; why? We have

$$\begin{array}{rrrr} & 3x^2 & -\ 8x & +11 \\ & -2x^2 & +12x & \\ & -4x^2 & & +17 \\ & x^2 & -\ x & -\ 1 \\ - & + & + & \\ \hline & -4x^2 & +\ 5x & +29 \\ \hline \end{array}$$

EXERCISE 7.2

1. Add:

(i) $7x^2y$, $-3x^2y$, $14x^2y$ (ii) y^3, $-2y^3$, $-3y^3$, $4y^3$

(iii) $-abc$, $13abc$, $5abc$

2. Perform the subtraction as indicated.
(i) $3y^2-18y^3$ (ii) $-12ab-6ab$
(iii) $23a^3-17a^3$

3. Simplify each expression by collecting and combining like terms:
(i) $-x^3+4x^2-8x^3+11x^2$ (ii) $12b-7b-3b$
(iii) $3x^3+y+7-6x^3-5y-11+2y$ (iv) $2b-7a+8a-5b+3c-c$
(v) $10m^2-9m+7m-3m^3-5m-8$

4. Add:
(i) $3x+4y-15z$, $6x+7y$, $12y-7z-9x$
(ii) $x^2y-3x+4$, $-8x^2y+3x-4$
(iii) $13x^3-7x^2$, $10x^2+8x^3$, $-5x^2$, $4x^2-3x^3$
(iv) $15a+11b-13c-17$, $18-12c-7b-3a$

5. Subtract:
(i) $3abc-a^3-b^3$ from $c^3+2a^3-b^3+abc$
(ii) $x^3-3xy-2y^2$ from $-2x^3+4xy-5y^2$
(iii) $-m^3+3mn$ from $3m^3-3mn+8$

6. From the sum of $3a-5b+3c$ and $2a+4b-5c$, subtract $4a-b-c+3$.

7. What should be added to x^2+xy+y^2 to obtain $2x^2+3xy$?

8. What should be subtracted from $-13x+5y-8a$ to obtain $11x-16y+7a$?

9. From the sum of $2x^2+3xy$, $-x^2-xy+y^2$ and $xy+2y^2$, subtract the sum of $3x^2-y^2$ and $-x^2+xy+y^2$.

10. Subtract the sum of $13m-11n+9p$ and $-7p+3m-5n$ from the sum of $6m-7n-5p$, $-4m+6p-9n$ and $5m-4n+3p$.

7.3 The use of Grouping Symbols

At times, it is necessary to indicate that an expression, consisting of two or more terms, is to be considered as a single number. For instance, to multiply $2x$ with the expression $3x-5y$, we must consider the expression $3x-5y$, as a single number. Symbols for grouping, namely, **parentheses** ( ), **brackets** [ ] or **braces** { } are used to set apart such expressions. The multiplication of $2x$ and $3x-5y$ may, therefore, be indicated by enclosing $3x-5y$ within parentheses or brackets or braces and writing as $2x\times(3x-5y)$ or, simply, $2x(3x-5y)$.

Thus, we will need to insert or remove grouping symbols while performing (algebraic) operations on expressions. For instance, to find the difference as indicated by $(3x^2-2x+7)-(2x^2-4x-3)$, we will **first** remove parentheses from each expression. What sign precedes the parentheses in the first expression? Plus sign. We, therefore, remove the parentheses and

write the first expression as it is. What sign precedes the parentheses in the second expression? Minus sign. This, of course, means that we have to subtract this second expression from the first one. We, therefore, remove the parentheses and change the sign of each term in the expression. We get

$$(3x^2-2x+7)-(2x^2-4x-3)=3x^2-2x+7-2x^2+4x+3$$
$$=x^2+2x+10$$

We, therefore, observe that

(1) **If a ' + ' sign precedes a symbol of grouping, the symbol may be removed without any change in the signs of the terms;**

(2) **If a ' − ' sign precedes a symbol of grouping, the symbol may be removed if the sign of each term is changed;**

(3) **If more than one grouping symbol is present in an expression, we remove the innermost symbol first and collect and combine like terms, if any. We continue this process outwards until *all* grouping symbols have been removed.**

Example 1: Simplify: $6a-(7b-c)$

Solution: We apply rule (2) and obtain $6a-7b+c$

Example 2: Simplify: $[2x^2-\{3x-(7x^2+4x-2)\}]$

Solution: We work outwards from the innermost symbol. Thus

$$[2x^2-\{3x-(7x^2+4x-2)\}]=[2x^2-\{3x-7x^2-4x+2\}]$$
$$=[2x^2-\{-x-7x^2+2\}]$$
$$=[2x^2+x+7x^2-2]$$
$$=9x^2+x-2$$

Now, how do we insert grouping symbols around expressions? Similar rules as (1) and (2) above are used. **If a grouping symbol preceded by a ' + ' sign is to be inserted, we simply insert the symbol around the expression.** In this case, we do not disturb the signs of the terms in the expression. However, if a **grouping symbol preceded by a ' − ' sign is to be inserted, we change the sign of each term in the expression and insert the symbol preceded by the ' − ' sign around it.**

Example 3: Insert a grouping symbol, preceded a by ' − ' sign, around the expression $3a-4b-2c$.

Solution: We can use either the parentheses or brackets or braces. Let us use the brackets. We obtain

$$3a-4b-2c=-[-3a+4b+2c]$$

Example 4: Place the last two terms of the expression $-a^2-8a+6b-3c+8d$ in parentheses preceded by a minus sign.

Solution: We have

$$-a^2-8a+6b-3c+8d=-a^2-8a+6b-(3c-8d)$$

EXERCISE 7.3

1. Simplify:

(i) $(2x-3y)-(x+2y)$
(ii) $(-8l+3m)-(5l-11m)$
(iii) $(3a-5b)-(-6a+2b)$
(iv) $(x^2+3x-2)-(4x-2x^2-2)$
(v) $x+(x-y-3)-(2x+y-4)$
(vi) $2l-[l-(3m-2l)+m]$
(vii) $-x+[-(3x+2y)+(x-4)]$
(viii) $(3x^2-4y+3x)-[x^2-(x^2-y)-3y+4]$
(ix) $[4-2a+5b-(a-b)+3]-(5a+4b-3c)$
(x) $-\{5x^3+x^2-[3x^2-(1-2x-x^3)-3x^3]+1\}$.
(xi) $6ab-\{-(2ab-4a)+[3b-(a+ab)+7ab]\}$
(xii) $-\{3x-4y-[-8y-6+3x+(2y-5x-3)-6]+8x-3y\}$

2. Place the last two terms in each of the following expressions in parentheses preceded by a ' $-$ ' sign:

(i) $9x+6z-4y-8$
(ii) $2x^3+4y^3-3z+9$
(iii) $a-b-4d-5$

7.4 Multiplication of Algebraic Expressions

7.4.1 Let us first **multiply two or more monomials,** for instance, $2x$, $-3y$ and $4z$. Since literal numbers denote numbers, it is easy to see that

$$\begin{aligned}(2x)(-3y)(4z) &= 2\times x\times(-3)\times y\times 4\times z\\ &= 2\times(-3)\times 4\times x\times y\times z \quad \text{(Why?)}\\ &= -24\,xyz\end{aligned}$$

Thus, we note **that the product of two or more monomials is the product of their coefficients with the product of all the literal factors.**

Example 1: Multiply $12x$, -8, $3x^2y$ and $4y^3$

Solution: Using the rule, we have the required product as

$$12(-8)\times 3\times 4\times x\times x^2y\times y^3$$
$$=-1152\times x\times x^2\times y\times y^3$$
$$=-1152x^3y^4 \quad \text{(See note below)}$$

7.4.2 Let us now **multiply a monomial and a bionomial,** for instance, $2a$ and $4b+3c$. We can apply the distributive property of multiplication and write:

$$2a(4b+3c)=(2a)(4b)+(2a)(3c)$$
$$=8ab+6ac$$

Example 2: Multiply $(-3x^2y)$ and (x^3+4y^2)

Solution: $-3x^2y(x^3+4y^2)$

$$=-3x^2yx^3-12x^2yy^2=-3x^4y-12x^2y^3$$

How will we multiply a monomial and a trinomial? Let us consider the following example:

Example 3: Find the product of $2x^2$ and $(-4x^2+4y^2-xy)$

Solution: $2x^2(-4x^2+4y^2-xy)=2x^2(-4x^2)+2x^2(4y^2)-2x^2(xy)$

$$=-8x^4+8x^2y^2-2x^3y$$

Can you state the rule that we have used in multiplying a monomial and a trinomial?

7.4.3 Finally, let us **multiply two binomials,** say, $(3a-2b)$ and $(5a-4b)$. Here we will have to use the distributive property of multiplication twice. Consider $(5a-4b)$ as one number (Recall, that the use of grouping symbols allows us to do so) and we have

$$(3a-2b)(5a-4b)=3a(5a-4b)-2b(5a-4b)$$
$$=3a(5a)-3a(4b)-2b(5a)-2b(-4b)$$
$$=15a^2-12ab-10ab+8b^2$$
$$=15a^2-22ab+8b^2$$

Thus we observe that to **multiply two binomials, we multiply the terms of one by the terms of the other, in order, and add (or subtract) the results.**

Example 4: Find the product of $(x+y)$ and $(x+y)$

Solution: We write the product as $(x+y)^2$ for obvious reasons. We have,

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Note: $x\times x^2=x\times x\times x=x^3$. Similarly $y\times y^3=y^4$.

$$(x+y)^2=x(x+y)+y(x+y)$$
$$=x^2+xy+yx+y^2$$
$$=x^2+2xy+y^2$$

Thus, $(\mathbf{x+y})^2=\mathbf{x^2+2xy+y^2}$

In other words, **the square of a binomial is the square of the first term** *plus* **the square of the second term** *plus* **twice the product of the two terms.**

What is $(x-y)^2$? State in words, a rule for multiplying $(x-y)$ by $(x-y)$.

Example 5: Find $(3x+2y)^2$

Solution: Using the rule, we can write

$$(3x+2y)^2=(3x)^2+(2y)^2+2(3x)\ (2y)$$
$$=9x^2+4y^2+12xy$$

Example 6: Find $(a-3b^2)^2$

Solution: We have $(a-3b^2)^2=[a+(-3b^2)]^2$
$$=(a)^2+(-3b^2)^2+2(a)\ (-3b^2)$$
$$=a^2+9b^4-6ab^2$$

EXERCISE 7.4

1. Multiply as indicated:

(i) $x^3(x^4)$ (ii) $(x^2)x^3$
(iii) $(x^2y^2)x^3y^3$ (iv) $x^5y(y^3)$
(v) $13(-4x^3y)$ (vi) $(-18a)\ (4bx)$
(vii) $(-6y)\ (-3y^2x)$ (viii) $(3a^2b)\ (-4a^2b^3)$
(ix) $(-3mn)\ (2m^2)\ (-n^2)$ (x) $(-3a^2b^2)\ (-6ab^4)\ (b^3)$
(xi) $(-2ab^2c)\ (3a^2bc)\ (-4ab^2c^2)\ (5abc^2)$

2. Find the following products:

(i) $-7x(2x-y)$ (ii) $ab(a^2-3b^2)$
(iii) $-b^2(2a^3-ab)$ (iv) $-8x^2y(4x-y^2)$
(v) $13x(x^2y+y^2x-3xy)$ (vi) $2b(a^2-2by+5y^2)$
(vii) $-4m^2n(3n+6mn-3)$ (viii) $-8x^3(2x^2-x^3-5+2x)$

3. Perform the indicated multiplications:

(i) $(3a-2)\ (a+5)$ (ii) $(m-3n)\ (2m+n)$
(iii) $(4a-3b)\ (3a+4b)$ (iv) $(2x^2+3)^2$
(v) $(2x^2-3)^2$ (vi) $(x^2+1)\ (x^2+2)$

4. Simplify the following expressions:

(i) $2x(5y+2z)-3x(-y+2z)$ (ii) $2a(3a+7b)-6a^2-4ab$
(iii) $(a+b)^2-2ab$ (iv) $(a+b)^2-(a-b)^2$
(v) $(x+3y)(3x+y)-(3x^2+9xy-3y^2)$
(vi) $x^2+x(x+1)-x(x-1)$ (vii) $(a+b)^2-a^2$
(viii) $(a+b)^2-b^2$ (ix) $(a+2b)^2+a(a+b)-b(a+b)-ab$

7.5 Finding the Value of an Expression

At several places in this unit we have reminded ourselves that the literal numbers represent numbers. Thus, given an expression $2l+2b$, if we know the values of l and b, we can calculate the (numerical) value of the expression $2l+2b$. If, in the above example, l is, say, 10 and b is 6, the value of the expression is $2(10)+2(6)$ or 32. Replacing the letters by their numerical values is called **substitution.**

Example 1: Find the value of $2y^3-3y^2+y-1$ if $y=-2$

Solution: We **substitute** $y=-2$ in the expression and get

$$\begin{aligned} &2(-2)^3-3(-2)^2+(-2)-1\\ =&2(-2)\ (-2)\ (-2)-3(4)-2-1\\ =&-16-12-2-1\\ =&-31 \end{aligned}$$

EXERCISE 7.5

1. If $x=1$, $y=2$, $z=-1$, find the value of each of the following expressions:

(i) x^2-y^2 (ii) z^3-x^3
(iii) $xy+yz-2$ (iv) $2xy^2-3x^2y+z^2$
(v) $y^2-z^2+x^2$ (vi) $4x^3+2y^3$
(vii) $(z+x)^2-2y$ (viii) $(x^3-y^2)(3y-2z)$

UNIT VIII

INTRODUCTION TO EQUATIONS

We will see, in this unit, how we can use literal numbers and restate, in terms of equations, certain problems that involve relations between known and unknown numbers. An equation is compared to a balance. Balance is used as a motivation to draw up rules for solution of equations.

8.1 Use of Letters to Denote Unknown Quantities

We have already used letters to denote numbers. Here, we will make use of them in a slightly different context. Let us consider the following example:

Example 1: The sum of a given number and twice itself is 162. What is the given number?

Here the given number is **unknown.** We could, as a first step, try out various numbers. Let us pick a number, say 10. Could 10 be the given number? No! What is 10+2(10)? Let us pick another number, say, 18. Could 18 be the given number? No! (Why?) We are still far away from 162. Commonsense tells us to try a larger number, say, 50. Could 50 be the given number? Again, no!

Even if we could find the number (try 54), this process of trial and error is time-consuming and unnecessary. As we will see, we can use the tools of algebra to find the number, rather easily and quickly.

Let us denote the unknown quantity, namely the given number, by a literal number, say x. We can now translate the problem into the language of mathematics. We say, we need to **determine x such that**

$$\mathbf{x+2x=162} \text{ or, } \mathbf{3x=162}$$

The above is an example of an **equation.** x is called the **unknown** of the equation. [We could have denoted the unknown by y or z or u, etc.—preferably by a letter from the later part of the alphabet.]

We note that

A statement of equality, which contains an unknown* quantity, is called a *conditional equation* **or, simply, an** *equation.* An equation has two **sides,** namely, the left-hand side (written as L.H.S.) and the right-hand side (written as R.H.S.). In the above example, we can see that $3x$ is the L.H.S. and 162 is the R.H.S. of the equation $3x=162$. A number which, when substituted for the unknown in the equation, makes its L.H.S. equal to its R.H.S., is said to **satisfy** the equation. The number is called a **solution,** or a **root,** of the equation. The method of finding the root(s) of an equation is called **solving** the equation.

Mathematicians have, from very early times, amused themselves by proposing and solving problems which can be reduced to equations. For instance, around 1800 B.C., an Egyptian by the name of Ahmes proposed and solved the following problem:

A number plus two-thirds of itself plus one half of itself plus one-seventh of itself equals 37. Find the number.

The Hindu mathematicians, as early as the 4th century A.D., used unknowns in different types of equations and found methods of solving them. We find the following problem, for instance, in the work, **Lilawati,** of Bhaskaracharya, a Hindu mathematician of 12th century A.D.

Out of a swarm of bees, one-fifth part settled on a blossom of Kadamba, and one-third on a flower of Silindhri, three times the difference of those numbers flew to the bloom of a Kutaja. One bee, which remained, hovered and flew about in the air, allured at the same moment by the pleasing fragrance of a Jasmine and Pandanus. Tell me, charming woman, the number of bees.

[Both, the problem of Ahmes and Bhaskaracharya are beyond the scope of this book. We will take these up at a later stage.]

Ancient Hindu mathematicians are given the credit for using the idea of symbols to denote unknown quantities. They gave various names to the unknown, such as (यावत्-तावत्) *yāvat-tāvat,* (meaning so much as) or *varna, bīja,* etc. and used the first letters of the names of colours, such as, का, नी, पी, या, रा, etc. to denote them. In about 300 B.C., these letters and the methods of raising them to powers and taking roots were quite common.

It was only in the 17th century, when Descartes (1596–1650), a French mathematician started using the letters x, y, z, etc. to denote the unknowns and the notation x^2, x^3, etc. to denote powers.

*We will study only the equations containing one unknown.

western forests are well drained ? Actually, the rainfall in this part of Canada is very heavy. But, the surface of the earth is very much above sea level. And, there are a number of streams and rivers which carry excess water down the mountain slopes and away from the area.

The climate in western Canada is mild compared to other parts of the country. Trees grow throughout the year. Often they are as high as 60 to 100 metres above the ground and some have trunks 2 to 3 metres thick. These huge trees make Canada one of the leading lumber producing countries in the world.

A Visit to a Lumber Camp

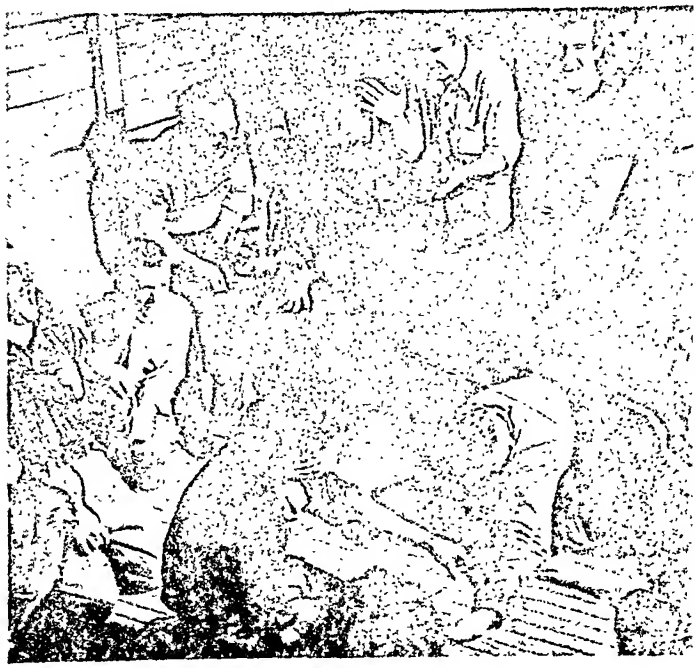
Our trip to a Hundson Bay area camp starts with a visit to the cookhouse. Here, about an hour before dawn, workers eat a very hearty breakfast. Porridge, bacon, eggs, bread, meat and potatoes are served. Most men take a huge portion of each ! Working out-of-doors in the cold weather makes them very hungry.

As the men leave after breakfast, they put on their heavy wool jackets. Then they pick up their lunches, their long-handled axes, their saws and start their walk into the forest. We will follow a man named Mr. Vincent. His job is to cut down trees.

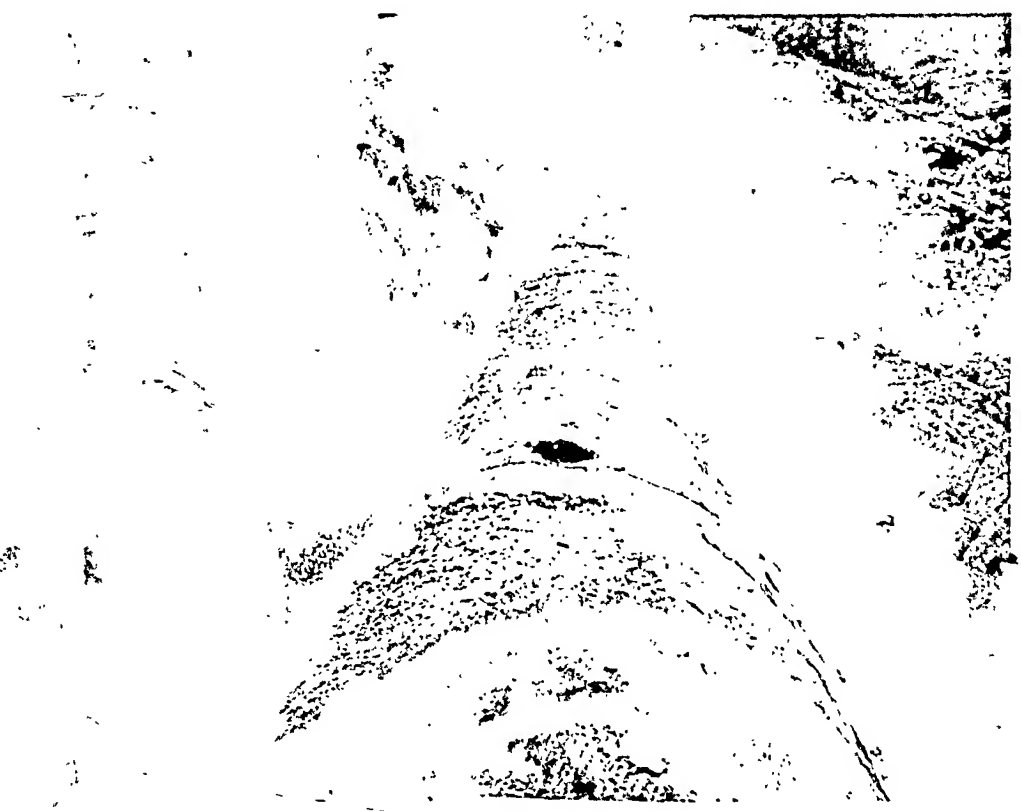
Mr. Vincent jumps on a large *sled*, pulled by a horse. The sled is a kind of carriage without wheels which is drawn by horses or dogs or reindeers. These sleds are used to take logs out of the forest. Mr. Vincent hops off

Workers are eating a hearty breakfast in a lumber camp.

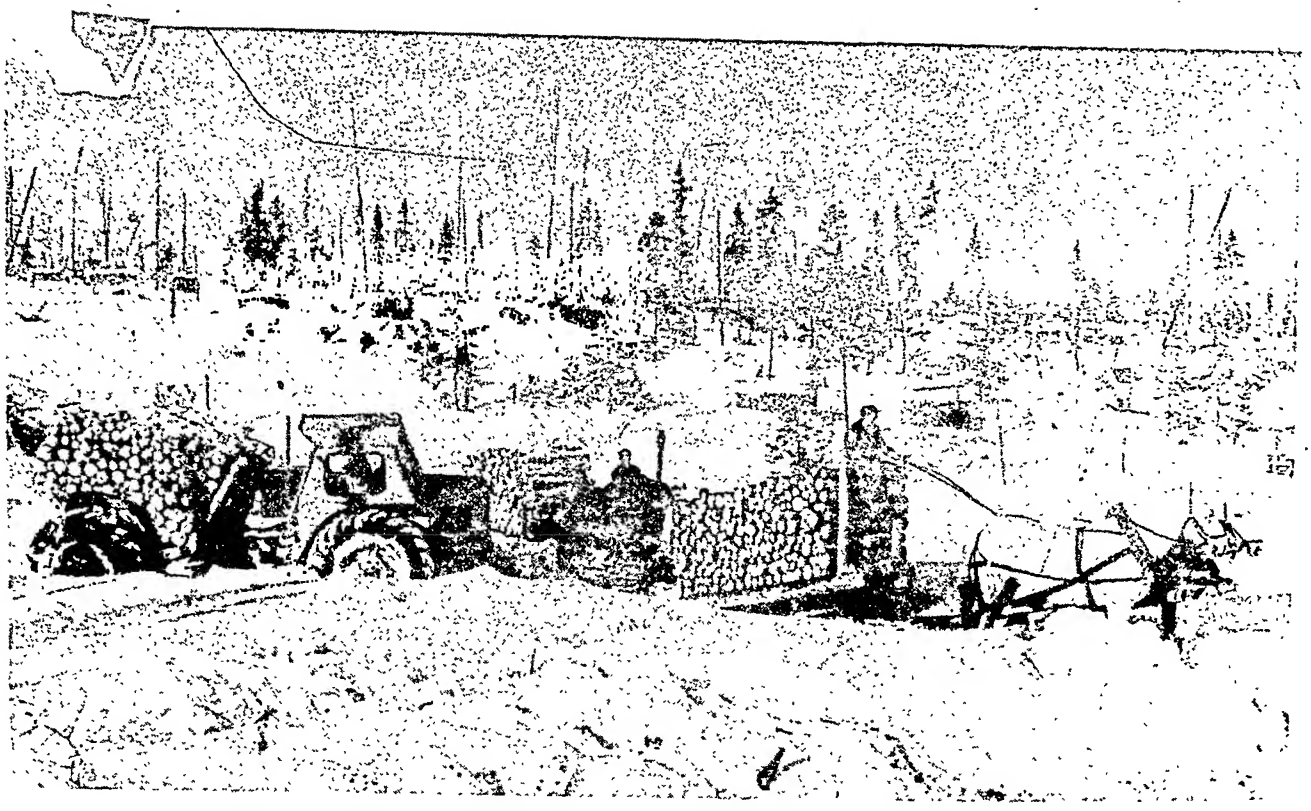
Lumber men enjoy a game in a lumber camp after a day's hard work.



A lumber man is cutting a huge tree with a powered saw. Look at his metal helmet, a protection against falling trees.



Here a lumber man is cutting a fallen tree into smaller pieces or logs after trimming the branches.



This picture shows the transportation of logs out of the forest by horse-drawn sled, truck and tractor.

when he reaches the part of the forest where he works. The sled is guided further down the road to an area where logs were cut on the previous day.

These logs are put on the sled and taken to the river which is nearby. In the winter season, the river freezes. The ice is so thick that it can support many sleds, horses and men without breaking. The sleds are driven on to the ice and the logs unloaded. The logs remain there until the weather becomes warmer. Then, the ice melts and the logs float down the river to the mill. There, they are made into pulp for paper and other wood products.

Mr. Vincent leaves the sled and walks further into the forest looking for trees that have been marked for cutting. This marking was done over a week ago by men who know when a tree is ready for cutting. The markers follow rules set by the Candian Government. These rules also require those who harvest trees to plant new trees as fast as the old ones are cut. In this way, they make certain there will always be trees to harvest in the coming years.

Mr. Vincent finds a tree that has been marked and begins work. To bring the tree down, he uses a saw which is powered by a motor. It cuts through a 25 centimetre tree trunk in two or three seconds ! A few years ago, Mr. Vincent used a hand saw. He supplied the power for this saw by pushing and pulling with his strong

arms. This was very hard work. Now, the motor-driven saw takes less of Mr. Vincent's energy and he is much less tired at the end of a day's work.

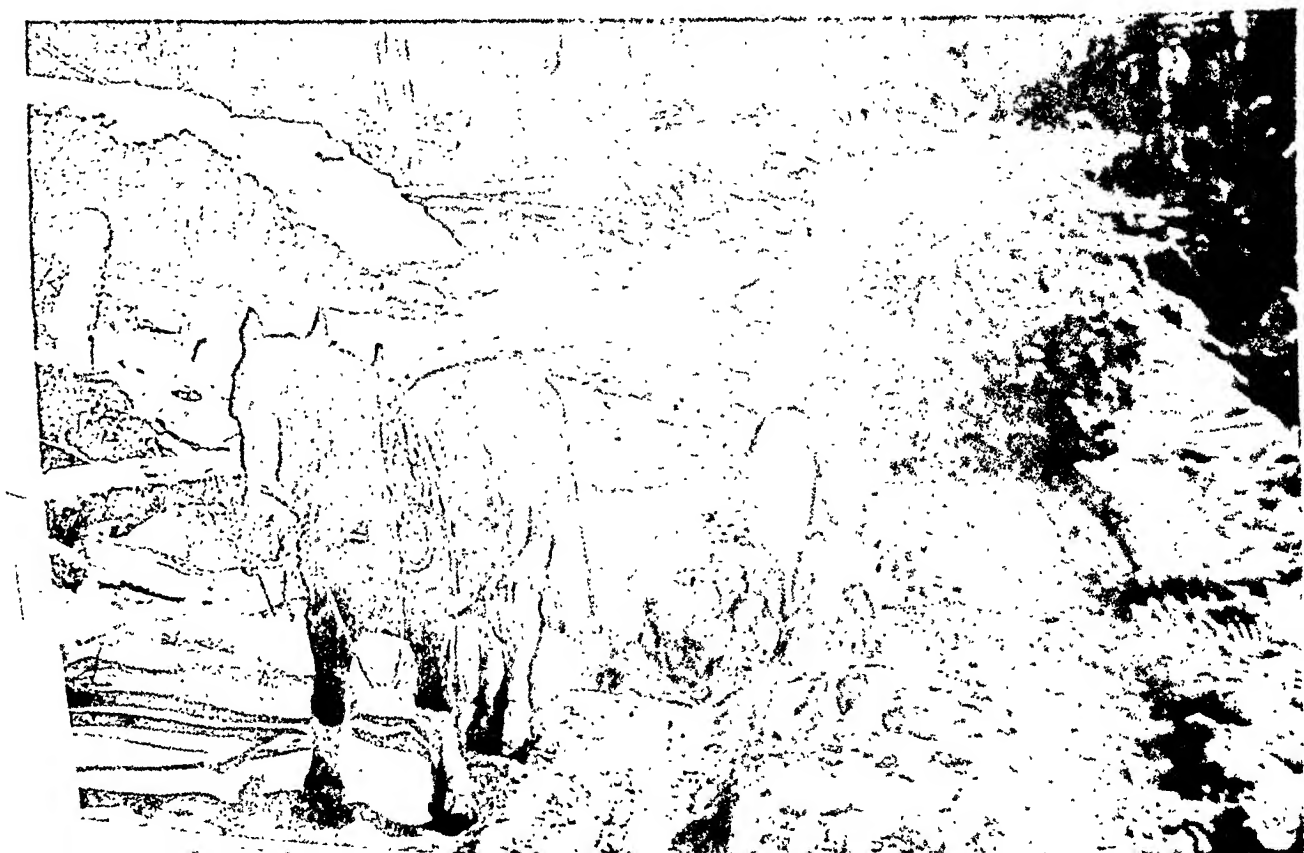
As the tree falls, Mr. Vincent shouts to warn others who may be nearby. Then, he cuts off the branches and saws the trunk into pieces of about two and a half metres length. He puts the pieces of logs cut from about 20 trees into one stack.

Usually Mr. Vincent cuts, trims and stacks about 40 to 50 trees each day. He works all day, stopping only to eat his lunch and make some tea. He starts for camp just before dark, walking the entire distance. However he takes a short-cut through the forest and wears snowshoes so that he can walk on deep snow without difficulty.

A snowshoe is made from a wooden frame shaped much like a tennis racket. The frame is criss-crossed with strips of leather. When the snowshoes are fitted on to the feet, it is possible to walk on deep snow without sinking into it.

After dinner, Mr. Vincent goes to the bunkhouse. This is the building

This log is being taken up to the lumber camp for use by the workers in a sawing competition on Christmas day.



where the forest workers sleep. But before going to bed, Mr. Vincent decides to write a letter to his family. His family lives in a small village located about 1000 kilometres from the camp. Mr. Vincent gets to visit them only two or three times during the winter season. Therefore, he writes very often to his family.

Pierre's Strange School

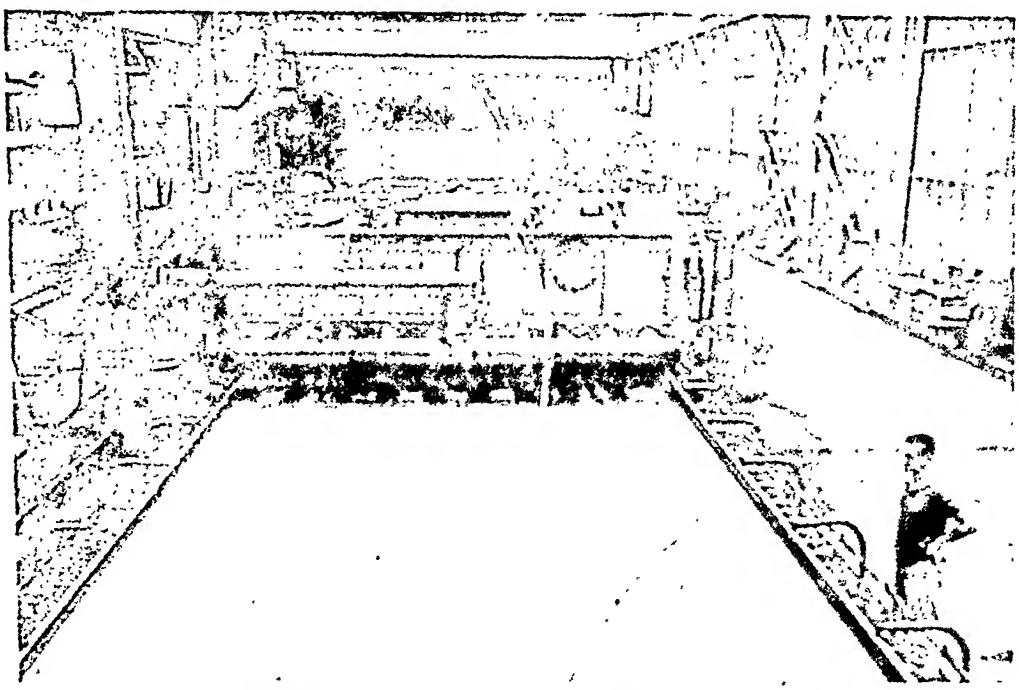
This time Mr. Vincent decides to write to his son Pierre who is in the sixth class at school. Most Canadian boys and girls go to school just as you do. However, in the area where Pierre lives, there are only a few families living nearby. Like Pierre, some of the children from these families go to school on a train.

The school train stops and leaves a bogie standing on one of the tracks. Classes are held in this bogie. The bogie has desks for pupils, a blackboard and library books. Pierre attends classes in the bogie for a few days and also gets his assignment for a number of weeks. Then the bogie moves on to another place where other children are waiting for the teacher to help them.

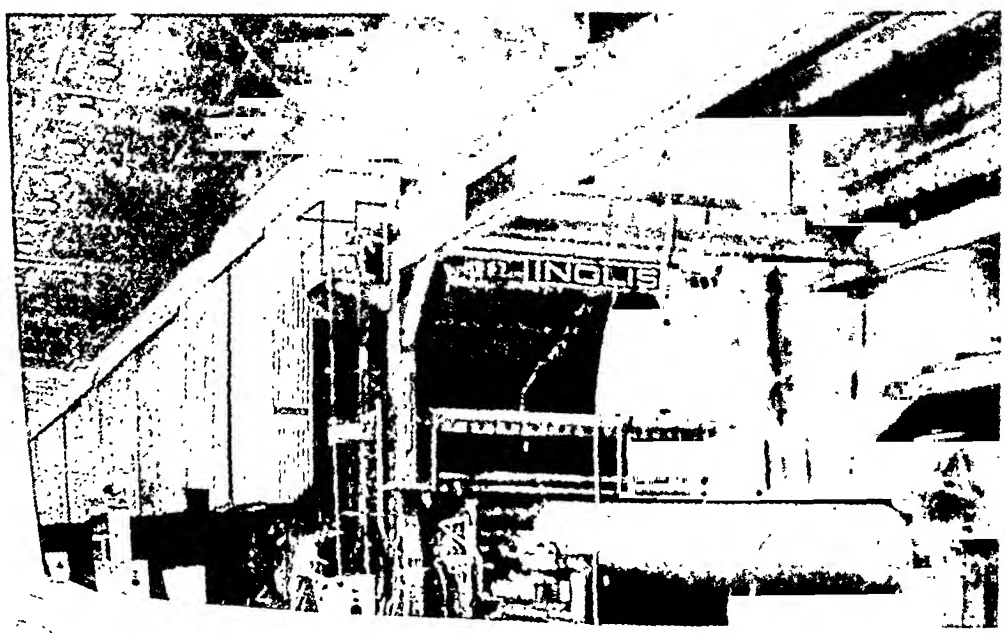
Only a very small number of children in Canada go to school on a train. Cities, towns and even some small villages have their own school buildings. In the extreme north-west region, the Government provides boarding schools for children. The long distance between home and school and the cold weather make it impossible

Here is a log driver with his hook. His job is to see that all logs float in the river in an orderly manner up to their destination.

Here bark is being removed from the logs. This is one of the first steps in making paper from wood.



The picture shows the pulp made from wood by this huge machine. The workman standing nearby is watching the process and checking the quality of pulp.



In this part of a paper mill you see a big roll of paper almost as big as a tree from which it has been made.

for children to return home at the end of each day.

Pierre studies many of the subjects you study. He has reading, writing, arithmetic, arts and crafts, social studies, health and science. He is looking forward to going to a secondary school and then to working in the forest. Many thousands of Canadians work in the forests and many more work in mills and factories making paper and other wood products. They are always trying to learn more about trees and the best way to grow and harvest them. Also, they are always trying to find more and better ways in which wood can be used.

Right now Pierre wants to be a forest worker after completing his secondary school. He believes that working in the forest will help him to decide on the kind of job he would like to do. Perhaps he may find an interest in raising some of the many furbearing animals found in the forests of his country. Or perhaps he will find an interest in the industry which makes paper from logs.

The paper industry is one of Canada's largest manufacturing industries. Of course, this industry depends on the millions of logs harvested each winter by the forest workers. But it also depends upon the skill of men who run the many machines used in the industry. There are many different kinds of jobs in the paper industry. Pierre may decide on one of them when he learns more about forest products.

Questions to answer

1 *List two reasons why Canada has a small population.*

2 *Explain why trees are harvested only during the winter season in Canada's north-central forests.*

3 *Write a paragraph giving reasons why you would or would not want to go to school on a train.*

4 *Why are trees harvested throughout the year in the western part of Canada's forests ?*

5 *Place a tick mark (✓) in front of any of the following sentences which are true.*

(a) *The forest worker usually lives with his family and travels to work each day by bus.*

(b) *The Canadian Government has rules which help to protect the nation's forests.*

(c) *During the harvest season, forest workers work from sun-up to sun-down, stopping only for lunch and tea.*

(d) *Most forest workers like to use a hand saw because it is easier to carry than a motor-driven saw.*

(e) *Only men who are not able to read and write work in the forests.*

(f) *Usually, all trees in an area are harvested at the same time.*

Things to do

Have a group discussion in the class in which a few students may discuss the life of the people in the forests of Canada while others may discuss life in the forests of Zaire.

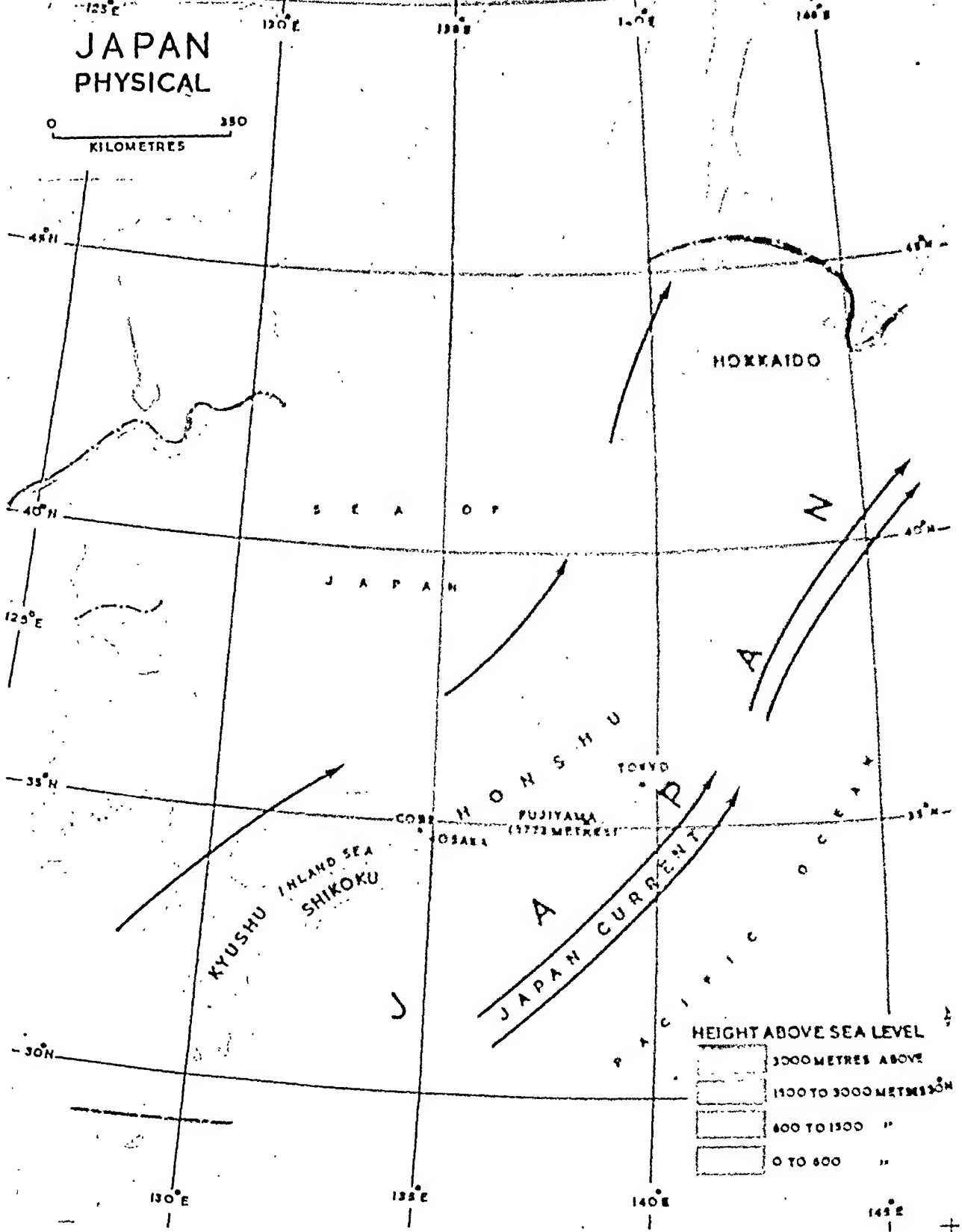

JAPAN
PHYSICAL
0
350
KILOMETRES
HOKKAIDO
SEA OF JAPAN
HONSHU
TOKYO
KOBE
OSAKA
FUJIYAMA
(3778 METRES)
KYUSHU
INLAND SEA
SHIKOKU
JAPAN CURRENT
PACIFIC OCEAN
HEIGHT ABOVE SEA LEVEL
3000 METRES ABOVE
1500 TO 3000 METRES
600 TO 1500 "
0 TO 600 "
40°N
35°N
30°N
125°E
130°E
135°E
140°E
145°E

Fig. 24

11 Islands of Japan

An Island Country

Japan is a country of islands located in the Pácific Ocean. These islands lie to the east of the Asian continent and stretch over a distance of 3000 kilometres.

Look at the map in Figure 24 and find the four main Japanese islands. They are named Hokkaido, Honshu, Shikoku and Kyushu. Which is the largest ? Which of the four main islands is the farthest north ? Note that the four main islands lie between the 30°N and 45°N parallels.

Delhi lies at about the 29°N parallel and the northern most point of our country in Jammu and Kashmir is at about 37°N parallel. This means that the four main Japanese islands are farther north than Delhi. It also means that many parts of Japan are farther north than any place in our country.

Since Japan is situated in the far north, you might think that Japan's climate is very cold. Actually Japan's climate is neither extremely cold nor very hot. This is because it is surrounded by large bodies of water. If you look at the map closely you can find another reason why most of Japan's climate is mild.

The Japan Current flows along the South-east coasts of the islands. Note the direction in which the current flows. Is it likely to be a warm or cold current ? Would the current affect the northern island of Hokkaido as much as it does the southern islands ?

The nearness of sea is also the reason why Japan has a very heavy rainfall. Throughout the months of June and July, most of the south western part of the country has heavy rainfall. Often during August and September, heavy rain and violent wind storms called **typhoons** slash across the islands causing great damage and even loss of life. In winter, cold, north-west winds blow across the Sea of Japan. As they cross the sea, these winds take up moisture which they drop as snow on the country's mountain peaks. These cold winter winds bring snow to the entire north western part of Japan. Often the heavy snow blocks roads and railroads, causing much hardship.

Look at the map of Japan again and see if there are many lowland areas on the main islands. You can see that Japan's small number of lowland areas are located on the coasts.

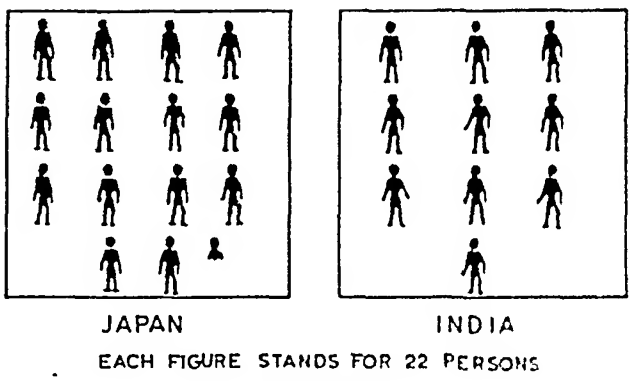


Fig. 25

Actually over two-thirds of the land is covered with forests. And most of the forests are on hills and steep mountain sides. Japan is often called a land of mountains. Mt. Fuji is the highest and most famous mountain in Japan. Locate it on the map. How high is it ? Look at the map again and find out which of the islands has the highest mountains.

Japan's People

Even though the islands are covered with forests and mountains, Japan has a population of more than 11 crores. Such a large number of people on these small islands makes Japan one of the most thickly populated countries in the world. You can compare the amount of land there is for each person in Japan with the amount of land there is for each person in India by studying the maps of these countries.

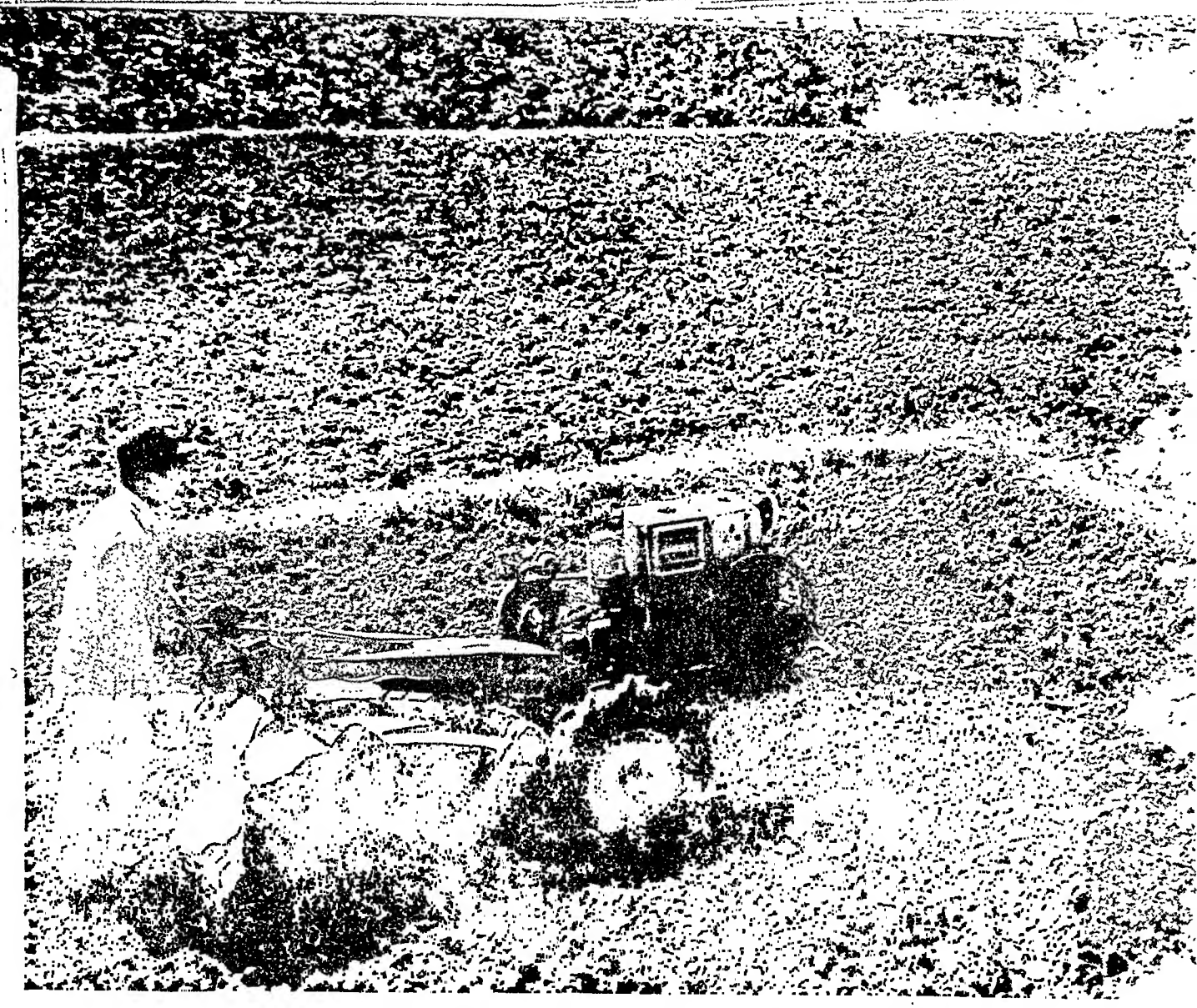
The illustration given above shows the number of people there are to one square kilometre piece of land in Japan. The illustartion on the right shows the number of people there are to one square kilometre of land in India. You can see that there are about 308 people to each square kilometre in Japan and 220 people to each square kilometre in India. This means that there are nearly one and a half times as many people to Japan's land as there are to India's land.

Besides being thickly populated, only six hectares out of every forty hectares of land in Japan can be used for farming. There is as much farm land in the state of Tamilnadu as there is in all of Japan !

Because Japan is so thickly populated and only a small part of its land is farmed, you may think that many of the Japanese people are poor. Actually the people of Japan earn a good income. Their earnings are among the best in Asia.

Farming in Japan

One reason why the people of Japan have good earnings is because they make good use of their land. More than half the people in Japan live in cities. But those who remain on farms use every possible piece of level land they can find. Also, they terrace hills and mountain sides to make them suitable for cultivation.



Japanese farmers working with their machines which are specially made for use on small farms.

In preparing **terrace fields** they cut down the slopes into small level fields on the mountain sides. These level fields look like a flight of steps. Sometimes these level fields are built almost to the top of a mountain. This is why some people say that much of the farming in Japan is done in the sky.

Most of the farmers in Japan grow rice because rice is eaten by all Japanese people at almost every meal. The farmers of Japan are considered to be the most productive rice growers in the world. Long ago they learned the importance of using a great amount of fertilizer. They used human waste and wood ashes to enrich the soil. Now fish and chemical fertilizers are also used. Farmers of Japan use more fertilizer than farmers in any other country. Also, some are now using small machines specially made to help

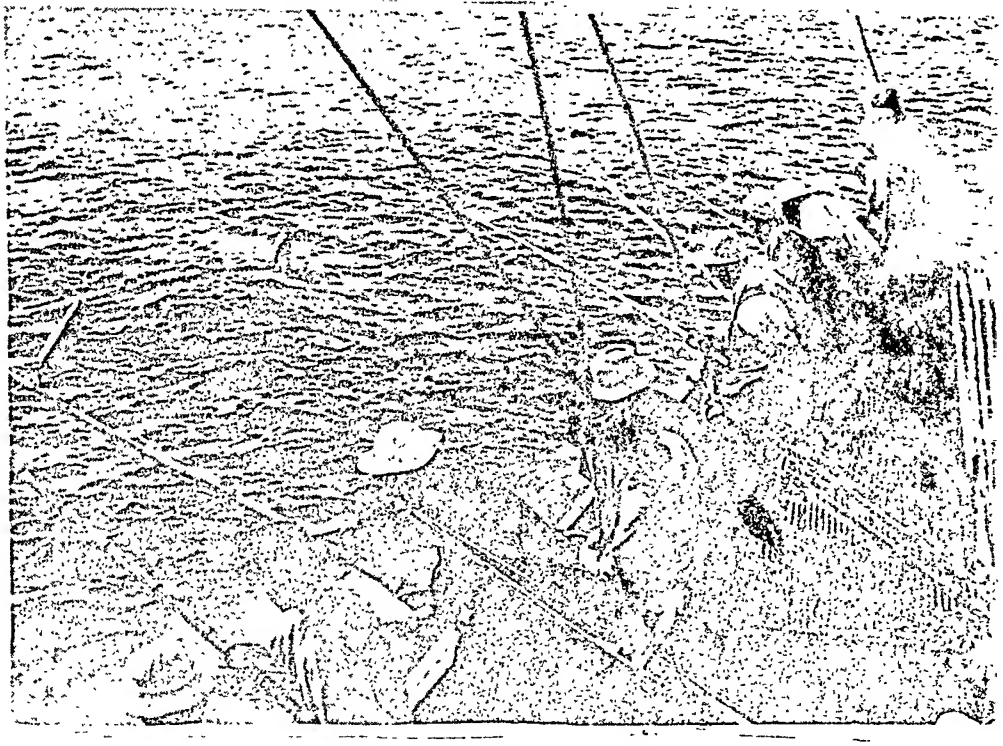
them on their small farms. As a result, they raise more food from one hectare of land than any other farmer in Asia.

The Japanese farmers grow many other crops besides rice. When they harvest their rice in September or October they plant a winter crop such as wheat or barley. On the narrow, low mounds of earth which hold the water in the rice fields, the farmers often plant vegetables and soyabeans. On steep mountain slopes they plant fruit trees, tea bushes and mulberry bushes. The mulberry bushes are used to feed the silk-worms.

Japanese Industries

However, in spite of all the farmers' efforts, the Japanese do not produce all the food they need on their own land. They also get food from the waters which surround their islands. Some of the best fishing in the world is done in the waters near the Japanese islands. Small boats of coastal fishermen crowd the harbours and beaches of Japan. These coastal fishermen sail only a few kilometres out to sea and then return to sell their catch of fish. Some fish are sold to be eaten fresh. Some are placed on mats to dry in the sun. Others are used in making fish oil, and still others are used for fish fertilizer.

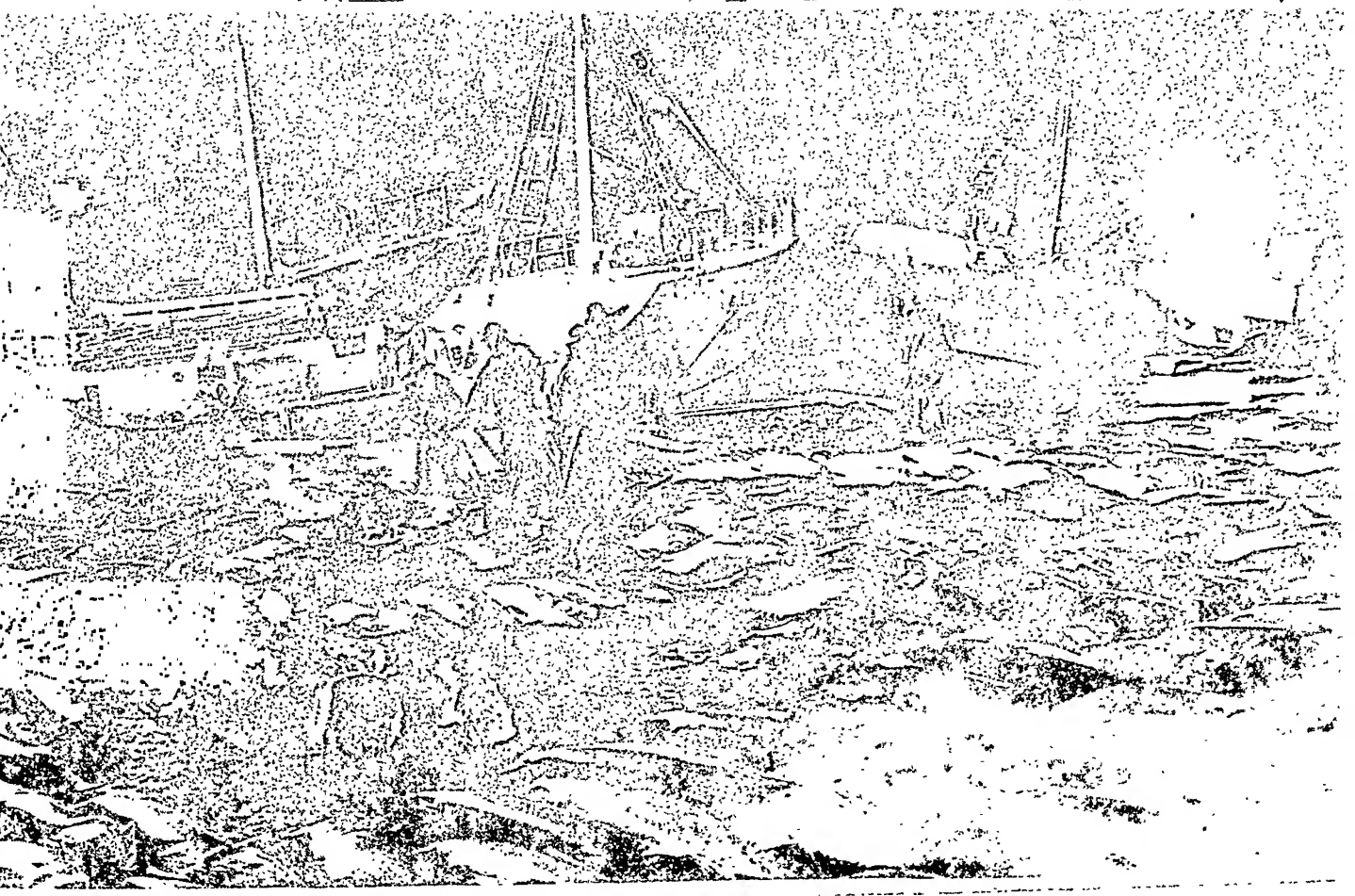
A crowd of fishing boats at one of the Japanese ports. Japan is sometimes called the nation of farmers of the sea.



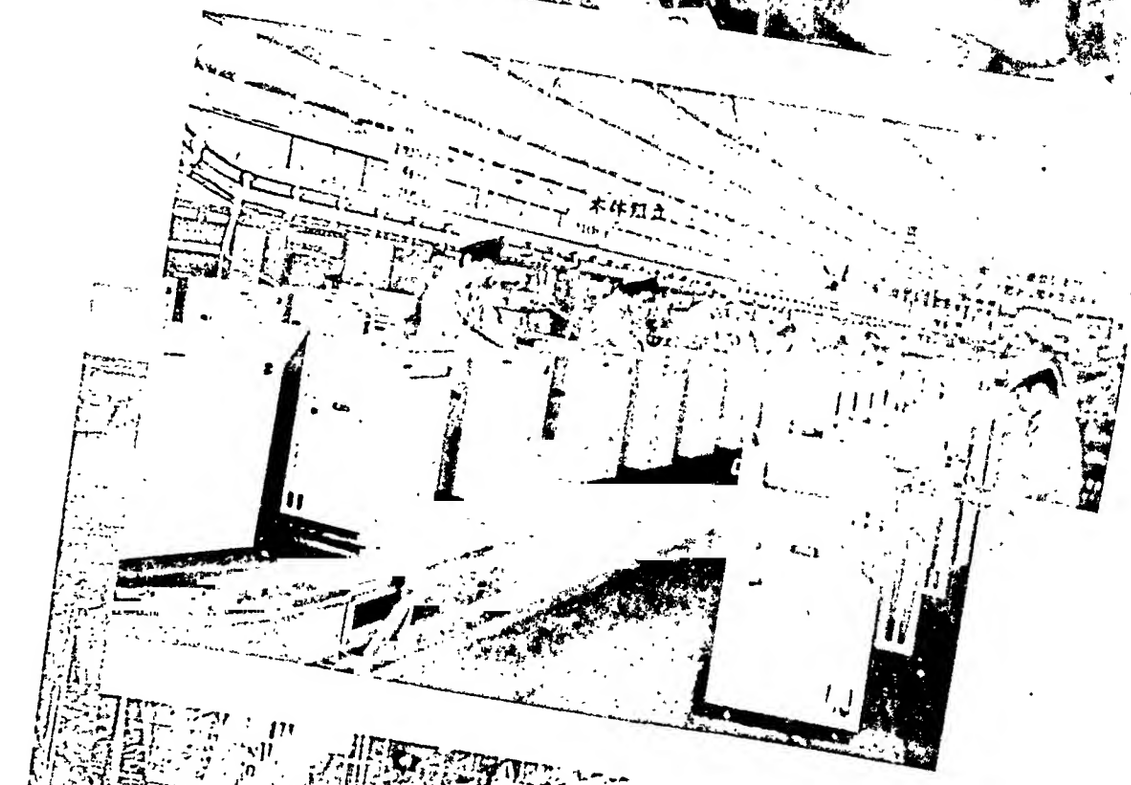
Fishing by line and hook is also done on a large scale in Japan.

Gradually the coastal fishermen are becoming less important in Japan's fishing industry. Fishing companies with bigger boats and more modern equipment are taking their place. These companies send their boats for long periods of time. They catch more fish at a smaller cost per kilogram. As a result, fish caught with big boats and modern equipment can be sold at a cheaper rate than fish caught by the coastal fishermen with their small

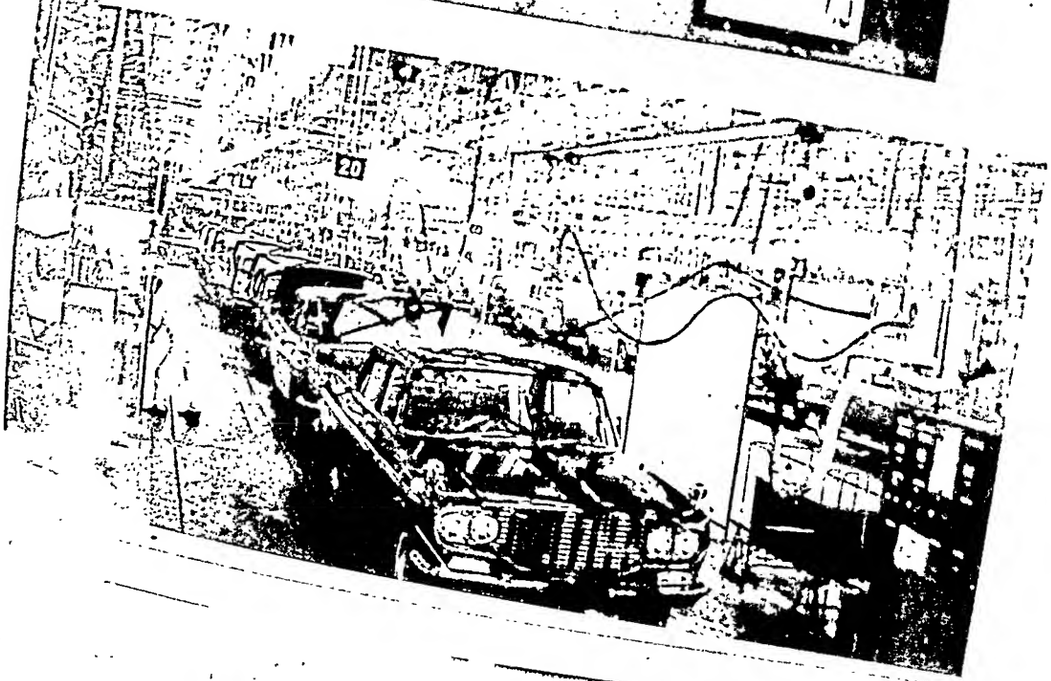
Fish market of Tokyo. Bigger boats with modern equipment go far out on the sea to catch fish. They bring about 11 lakh kilograms of fish to this market every morning.



Japanese women assembling transistors in a transistor factory. Japanese transistors are famous throughout the world.



The picture shows Japanese workmen fitting together the parts of washing machines. These machines are on a moving platform and pass one by one in front of the worker.



Another assembly lin in an automobile factor in Japan. The car in front of the line in the picture is ready to be driven away, while those at the back have many parts to be fitted in.

oats. The coastal fishermen are now nding other ways of earning a living. ome have taken to farming. Others ork in nearby factories.

On the other hand, modern equipient and bigger boats make it possible o catch more fish than the Japanese eople want for themselves. Today apan's fishing industry is one of the argest in the world. Japan sells much of its fish products to other countries ind the money it receives is used to buy things that are not available in Japan.

Japan buys a number of different things from other countries. It buys cotton and wool for its cloth factories. It buys coal for its growing steel industry even though Japan has coal mines of its own. It also buys petroleum, petroleum products and machinery from other countries.

While money from the sale of fish products is paid for some of the things Japan buys from other countries, most of the money for these things comes from the sale of manufactured products. Manufacturing industries are very important to Japan. First, they help to pay for things bought from other countries. But more important, manufacturing industries provide work for more than one-half of the Japanese people. These people do not depend on Japan's small amount of farm land for income. Neither do they depend for a living on Japan's other natural resources such as forests, fish and coal. They earn their income through their ability to make the raw materials bought from other countries into useful products which are sold all over the world.

Japan sells many manufactured products to other countries. The most important are cloth, trucks and cars, iron and steel, chemicals, electronics and ships. Today the Japanese people are the world's leading ship builders. Their shipyards have the latest equipment and their workers are highly skilled.

The location of three of Japan's leading industrial cities is shown on the map in Figure 24. Tokyo is Japan's capital. It is the second largest city in the world with a population of over one crore. Kobe and Osaka are on the Inland sea. Both are industrial cities with cloth factories, iron and steel and shipbuilding industries.

In Kobe between 6.30 and 8.30 in the morning, the streets are crowded with people who are on their way to work. They crowd into buses, street cars, trains and automobiles. Everyone is hurrying, eager to get to work on time.

Painters are giving final touches to a very huge ship built in one of Japan's shipyards. The ship building industry of Japan is highly developed. Can you find the height of this ship?

Tokyo Central Station: In Tokyo between 8 and 9 in the morning many people from the suburban areas come to work. At this time trains, buses, cars, railway-platforms, streets, etc are all crowded with people who are on their way to work.

Soto of Kobe

In the crowd is a young man named Soto. Soto works in a large shipyard as a welder. He has learned how to join two pieces of steel together by using a torch which throws off a very hot flame. Soto's skill as a welder makes it possible for him to earn much more than he could from farming, with his parents on their one hectare farm near Kobe.

In Kobe, Soto lives with his uncle. Soto uses some of his earnings to pay his uncle for lodging and food. He saves a small part of his earnings each month and hopes someday to live in his own flat.

Soto enjoys his work. He feels very lucky to be working for such a large company which pays him a good income. His company also provides him with paid vacations, and a chance to get further training and free life insurance for his family.

Home-factories of Japan

Not all the people who work in Japan's manufacturing industries work for such a large company. About one-half of the industrial workers of Japan work in small factories. These small factories are often called **home-factories**. This is because the work is often done in a part of the home and the workers are members of the same family. Often a few relatives are hired to help with the work. Usually there are less than six or seven people working in these home-factories.

Japan's home-factories make all kinds of products. Straw mats, pottery, bamboo hand fans, and even small machine parts are made in these factories. Home-factories are still an important part of Japan's manufacturing industry. However, some feel they will slowly disappear as more and more people are hired by the large companies. Most Japanese workers like to work for the large companies because they provide many benefits which home-factories cannot afford to give.

The people of Japan have learned to use their small amount of natural resources wisely. They have solved many problems connected with living on small islands. What they lack in natural resources they have made up for through hard work and a desire to find better ways of doing things. As a result, Japan is one of the leading industrial countries of the world.

Questions to answer

1 *With the help of the map in Figure 24, complete the following sentences :*

(*a*) *The main Japan Current is found in the*———— *Ocean.*

(*b*) *Tokyo, the capital of Japan, is located in*————*Island.*

(*c*) *The four main Japanese islands are called*————, ————, ———— and ————.

(*d*) *The body of water that affects Japan's climate during the winter season is called* ————————.

2 *Nearness to the sea is one of the reasons why Japan leads the world in two industries. Name these two industries.*

3 *Why doesn't Japan depend entirely on its own natural resources for its factories ?*

4 *Why are manufacturing industries very important to Japan ?*

5 *Re-read the section of the chapter which tells about Japanese farmers. List as many reasons as you can find to show how they raise more food from one acre of land than any other farmer in Asia ?*

6 *Each sentence given below has several endings. Some of the endings make the sentences true. Put a tick mark (✓) before each true ending.*

A. One of the reasons why fishing is more important to Japan than to other countries is that

———— *good farm land is scarce.*

———— *there is not enough water to grow rice.*

———— *some of the world's best fishing grounds surround Japan.*

B. The reason why coastal fishermen are becoming less important in Japan's fishing industry is because

———— *they are needed to work on the farms and in factories.*

———— *the bigger and more modern boats are able to catch fish more easily and cheaply.*

———— *Japanese farmers use less fish fertilizer.*

C. *Most Japanese people like to work in new large factories because*

———— *most of the factories are close to their homes.*

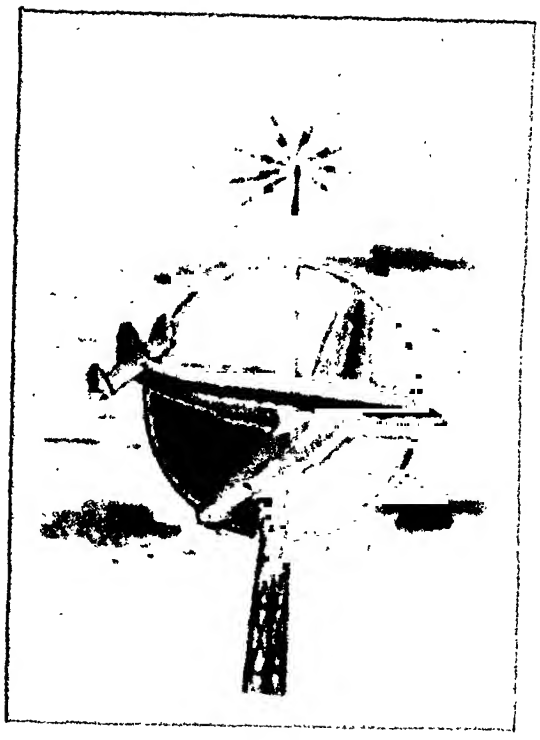
———— *their income is usually good.*

———— *they can start work at any hour they please.*

Things to do

1 *Using the distance scale for the map in Figure 24, mark off on a piece of paper the distance which stands for 150 kilometres. Place this paper at various places on the map of Japan. Is there any place in the country which is more than 150 kilometres from the sea ?*

2 *Collect pictures from newspapers, periodicals or magazines about the life of Japanese people. Classify the pictures collected and prepare a class album from them.*



WORLD TRANSPORTATION AND COMMUNICATION

FROM the beginning of time people have enjoyed the thrill of travelling at rapid speeds and in little known regions. They have always been curious about other people and places. People have always been interested in learning about how others live. They have always wanted to trade with others.

These are some of the reasons why man invents new and better ways of travelling and carrying goods from one place to another. These reasons also help to explain why men try to invent better ways of exchanging information.

In this Unit you will learn about different ways that are used to carry people and goods from one place to another, that is **transportation.** You will also learn about new inventions which help people exchange information or **communicate** with each other. As you think about what you learn you will realize that transportation and communication can completely change the way people live.

12 Story of Transportation

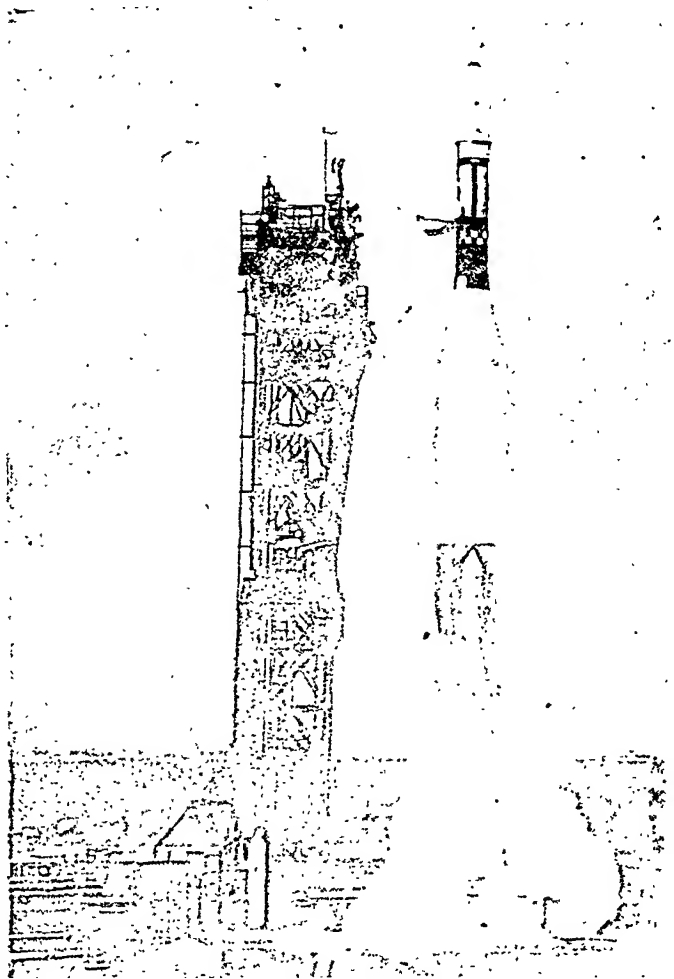
Rockets are the newest way of carrying people and goods from one place to another. At present only a few scientists from the United States of America and the Union of Soviet Socialist Republics have travelled in rockets. But the time will come when more people will use them.

Unmanned and manned rockets have already landed upon the moon. The distance from the earth to the moon is about four lakh kilometres. Scientists have taken about eight days to go to the moon and come back. They have brought back not only photographs of the moon but also rocks from the moon's surface.

Actually rockets have already travelled even greater distances. In the year 1962 an unmanned rocket from the earth flew past the planet Venus. Radio messages were received from this rocket even after it had flown past Venus and was more than eight crore kilometres from the earth. In 1965 another unmanned rocket was sent into space. This rocket flew past the earth's neighbouring planet Mars.

The story of how transportation has improved to the point where people can travel in rockets is an interesting and exciting one. Actually it is more than one story. It has three stories, stories of travel by land, by water and by air.

This rocket is leaving the Earth for its journey to Mars. The trip will take about seven and a half months to reach Mars. After reaching there the rocket will send photographs of Mars' surface to the earth



Camel cart is still in use in some parts of India. Load for transportation is kept on its roof and the passengers sit inside the cart. Notice the front wheels of the cart in the picture.

Travel by Land

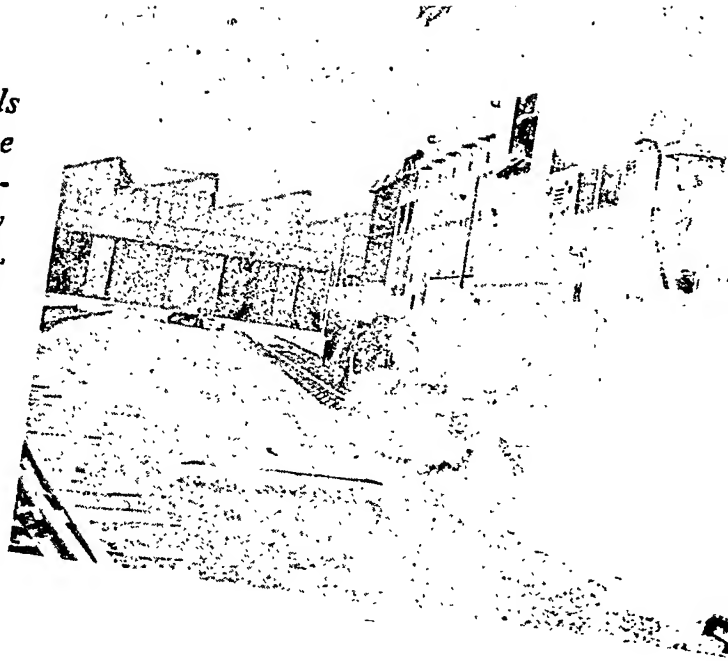
There are two very important events in the story of travel by land. The first is when men shifted the burden of travel from their legs to the backs of tamed animals. That is, the point in time when men learned to use animals for transportation. No one really knows when this took place. It happened so long ago that there is no record of it. Also, no one really knows what kind of animal was the first to carry men and goods. We can only guess that such animals as the llama, donkey, camel, elephant, horse, reindeer, yak, etc., were probably used.

These animals are still used for transportation in many places throughout the world. In India, the elephant, camel, yak and donkey transport both people and goods. In South America, the llama is used to carry goods. In the frozen land of the north, the reindeer is still a means for transportation. In the far north of the Himalayas and in Tibet, the yak is a means for transportation.

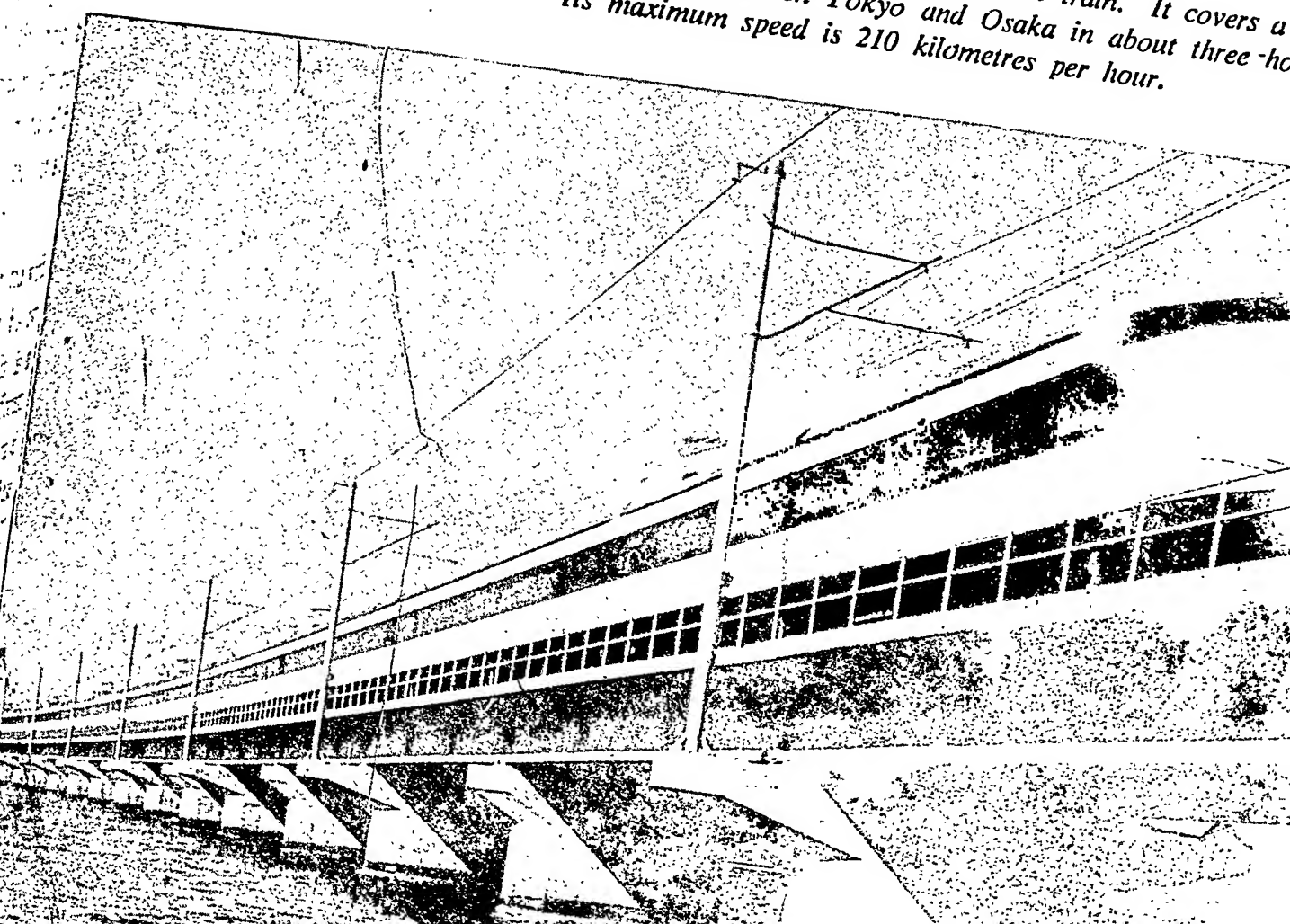
There are some places in the world where man still depends on his own legs for transportation. This is in mountainous regions and thick forests. Here animals find it difficult to travel, and road building is costly in these places. So in such parts man is still the chief means of transport.

The second important event in the story of travel by land is the invention of the wheel. How and when the wheel was invented is not known. It happened so long ago that no one knows when it took place. However,

Diesel engine travels much faster than the steam engine. Diesel engines, therefore, are now used by Indian railways in good numbers.



This Japanese passenger train is the world's fastest train. It covers a distance of 515 kilometres between Tokyo and Osaka in about three ho Its maximum speed is 210 kilometres per hour.



the importance of the wheel is well known. It made possible the cart which was first drawn by men and then by animals. With the invention of the wheel, heavier loads could be carried and at a much faster rate than before. Men and animals supplied the power to push and pull carts for many hundreds and thousands of years.

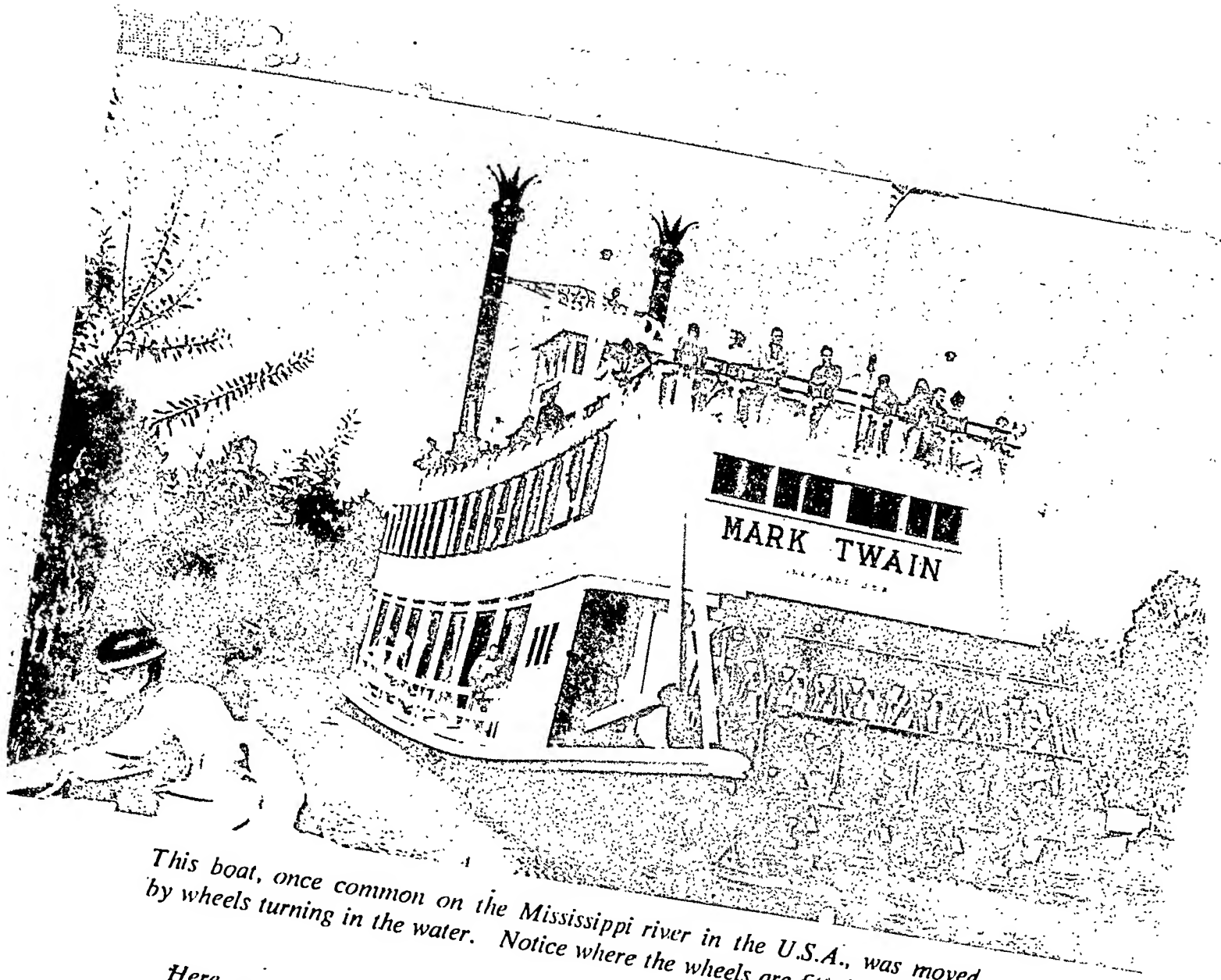
Then, about two hundred years ago, a steam-powered cart was invented. The first steam cart travelled at a speed of five kilometres per hour! Today there are many kinds of vehicles operating on land which travel at more than ten times that speed. Automobiles powered by petrol engines travel at speeds of 90 to 100 kilometres per hour. Trucks travelling almost as fast are used to haul goods over long and short distances. And modern railway engines pull passenger bogies at even higher speeds. A passenger train in Japan travels at the unbelievable speed of over 200 kilometres per hour. This is forty times as fast as the first steam carriage two hundred years ago.

Travel by Water

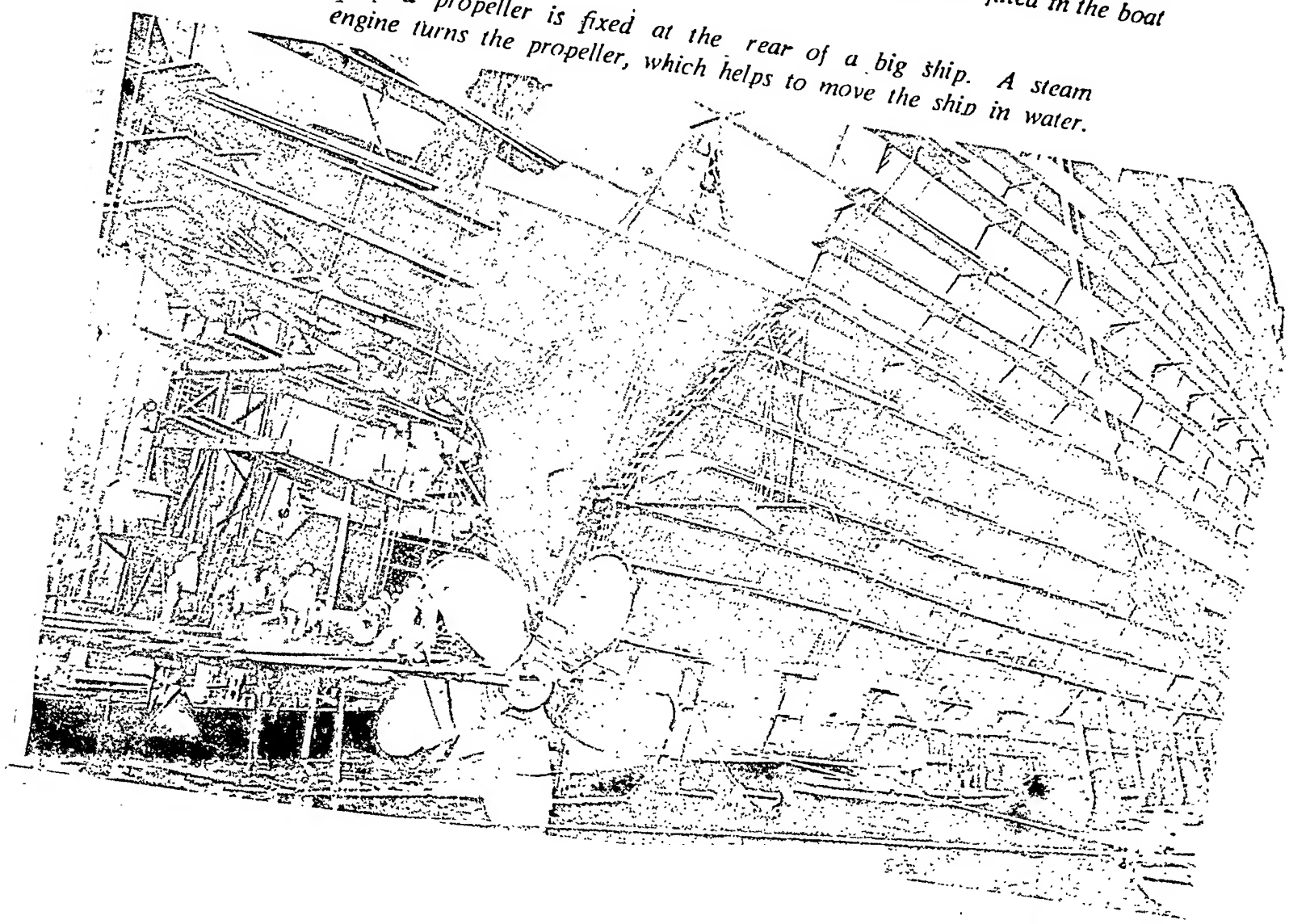
The story of travel by water is the story of boats and ships. The first boats had to be rowed or paddled. Men supplied the power. Later, sails were used and wind provided the power. Sails were followed by steam engines that drive boats and ships through water by turning wheels or propellers.

Many years ago, travel by water was almost the only way to travel long distances. At that time, good roads and railroads did not exist. Rivers, lakes and oceans were roadways. These were available free of cost. They were provided by nature. Since good roads were built and trains and motor cars were invented, water transportation was used mostly on long, big rivers. Today, it is used to transport heavy goods where speed is not necessary. Trucks, railways and automobiles are used more and more these days.

These vehicles are used because they are faster than water vehicles. Boats and ships cannot be driven through water as fast as trucks, trains and automobiles can travel on land. Also, boat and ship routes are usually not the most direct routes. Most rivers twist and turn as they make their way to the sea. Even ocean routes are not always the most direct routes. Very often it is necessary to go round continents in order to reach a particular place. Therefore boats often travel long distances to reach a place which is not very far away.



This boat, once common on the Mississippi river in the U.S.A., was moved by wheels turning in the water. Notice where the wheels are fitted in the boat



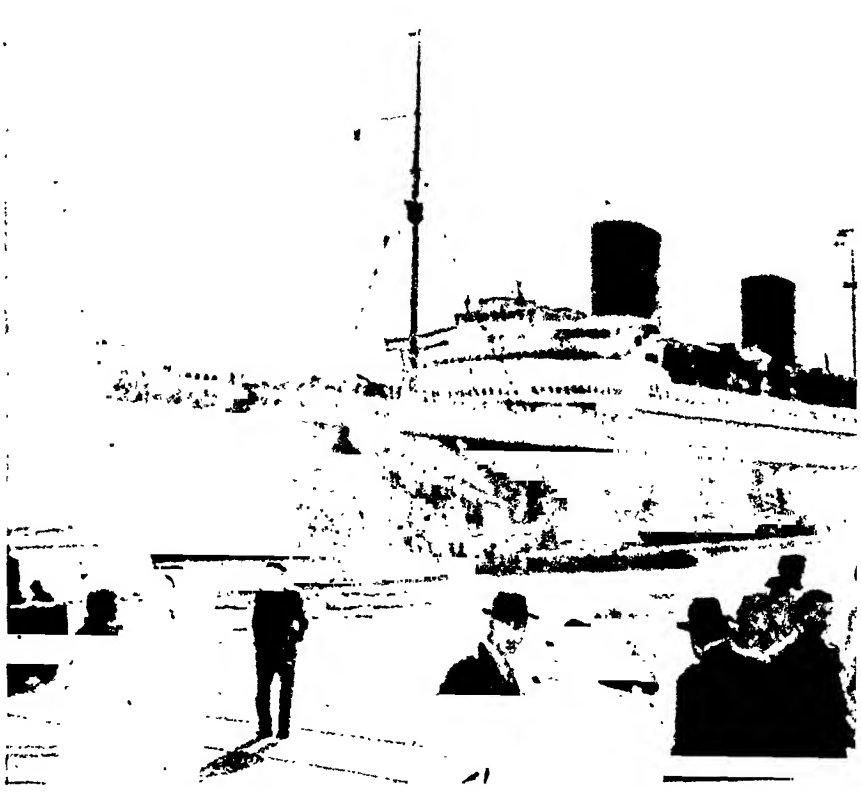
Here a propeller is fixed at the rear of a big ship. A steam engine turns the propeller, which helps to move the ship in water.

There is another reason why land transportation is used more and more. Today, good roads make it possible for land vehicles to reach many different places. For example, trucks can travel to small and distant villages. On the other hand, a boat can only reach places located along banks of rivers and canals and along sea shores. Also, a big boat can only travel on oceans and deep rivers. And there are some rivers which have sufficient water for boat traffic only during certain seasons of the year.

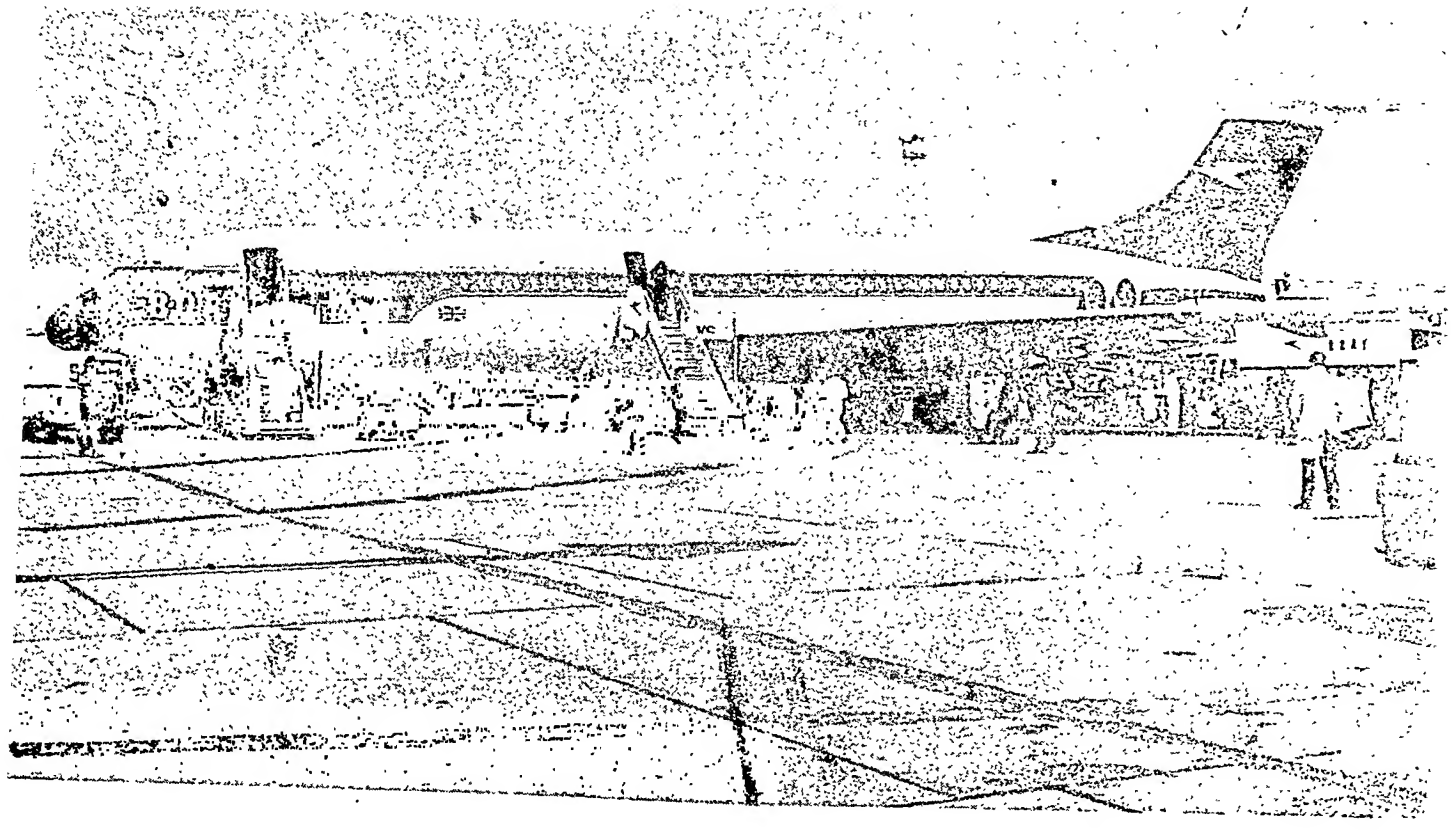
In spite of these handicaps, travel by water is still an important kind of transportation. It is the cheapest way to carry large amounts of goods long distances. And in many cases it is the only way you can travel from one country to another.

There is at least one other reason why water transportation continues to be important. Bigger and better ships are being built. New cargo ships weighing over 100,000 tons now travel from one country to another. In 1959, the first atomic-powered cargo ship was set afloat. The engines of this ship use neither coal, nor oil or petrol. Their power is supplied by atomic fuel. This is the same fuel now used to produce electricity in some parts of India.

One hundred and fifty pounds of atomic fuel takes up a space only 2 metres high, 2 metres wide and 2 metres deep. This amount of fuel will drive the ship for about three years ! If the ship were powered by oil, about 80,000 tons would be needed for the same period of time. It would



'Queen Elizabeth' is one of the largest ships in the world. About 2500 people can travel together in this ship. It is, therefore, very often called a floating city.



This is a picture of a very fast flying modern airplane. The speed of this plane is more than one thousand kilometres per hour.

carry less cargo and would have to stop and refuel many times.

Travel by Air

The first air travel was by balloon. A large basket-like container was attached to the balloon. And the balloon was filled with a gas lighter than air. One or more persons would stand in the basket to control the rate at which the balloon was to rise or fall. Balloon travel was not very popular. It was very difficult to control the balloon in flight. Only those wanting a bit of adventure and excitement attempted to ride a balloon.

The first successful flight in an airplane powered by a petrol engine was made in the year 1903. This first airplane flew for less than a minute. Today, passenger airplanes remain in the air eight to ten hours and fly at speeds of over nine hundred kilometres an hour.

Today, an airplane which holds over 700 passengers has been built and is being tested. Now a number of air planes that can carry 500 passenge are in use. There are airplanes tha can carry over fifty tons of goods at speed of over nine hundred kilomet per hour. There will be planes i

future that can travel around the earth and return to the same place within 25 hours. By then, there will also be airplanes flying over 2500 kilometres an hour and carrying passengers. Each improvement made in air travel since 1903 has made it possible to carry more goods and people at a speed faster than ever before.

Time-Distance

With each improvement in transportation our ideas about distance are changed. For example, if you lived fifteen kilometres from a friend's house and could reach it only by walking, you probably would not visit him very often. It would take you about three hours to reach his house. Another three hours for the return trip would require six hours to travel the distance of thirty kilometres. You would probably think your friend lived a long distance away.

An air hostess, on an airborne Air India plane is serving a delicious meal to two passengers. Look at the passengers—they are as comfortable as if they were in their own homes!

On the other hand on a bicycle, the entire thirty kilometre trip would take only three hours or less The distance in kilometres is the same in each case. But the distance in relation to time is reduced by half if you travel by bicycle.

An automobile travelling at 60 kilometres per hour would make the thirty kilometre trip in half of an hour. An airplane travelling at 900 kilometres per hour cuts the time required to a mere two minutes. In terms of the time required for the journey, your friend's house is as close as your verandah! But of course, you would not take a plane for this short distance !

Less than 150 years ago the overland trip from Bombay to Calcutta could be made only by cart or on the back of an animal. The trip took months. The distance seemed great. Today, using an Indian Airlines passenger airplane, the trip takes only about four hours. Therefore, today people do not think the distance from Bombay to Calcutta is so great. They measure distance in terms of the time it takes to travel rather than the actual distance in kilometres. The distance which is measured in terms of time is called **time-distance.**

The trip from Delhi to Madras is about forty-two hours by train. But you can also go round the earth by air in almost the same time. When people compare these trips, they think of them as being of equal length. Who knows, some day people may think a trip to the moon as equal to a bus and train trip from Srinagar to Madras.? It is possible that those trips will take about the same length of time !

Changes in the Way We Live

More people travel today than ever before. The speed and ease with which we can travel make this possible. We need not leave our homes or our work for long periods of time in order to travel long distances.

With increased travel comes the desire to learn more about other places and people. When we learn about the way other people live, we often change the way in which we do certain things. Sometimes just being with other people makes us change. We change without realizing it. Other times, we make a special effort to do things as others do because we like their way of doing things. Or we think their way of doing certain things is better than our way.

This is happening throughout our country today. People from North India are travelling to South India. As a result, some of these people

are slowly changing the way in which they do certain things. It is not unusual to find people from India's northern states enjoying *dosa* or *Mysore paak*. Likewise, some people who live in southern states now eat *chappatis* quite often. Similar changes are taking place in the clothing people wear and the language they use.

Better transportation changes us in other ways. Years ago people worked very close to where they lived. Most of them farmed land close to the village in which they lived. Those who worked in shops always lived in the village in which the shops were located. Today better transportation makes it possible for some people to travel as much as 30 to 40 kilometres to work each day, particularly city dwellers.

Better transportation also makes people dependent on each other. In Chapter 11 you learned that the people of Japan depend on people of other countries to supply them with cotton, wool and coal. More than one-half of the workers in Japan work in industries where these products are used. Without these products the workers in these industries would have to find other ways of making a living. In other words, transportation provides a livelihood to a large number of people.

Transportation also makes it possible for various countries to produce what they are best able to produce. In Chapter 11 you learned that Japan has one of the largest fishing industries in the world. The Japanese are able to catch and tin

A man in space. This traveller while going round the earth in a rocket, has come out from it and is moving in space. The speed of a rocket is much higher than the fastest airplane. Notice the curvature of the earth in the background of the picture.

fish more cheaply than people in most other countries. And good transportation makes it possible for them to sell their fish products all over the world.

In India we produce more and better jute, tea and textile goods than other countries in the world. We also produce those goods more cheaply than most other countries. As a result, many people in India work for producing these products. Their jobs depend on transportation which carries these products to all parts of our country as well as to other countries of the world.

Questions to answer

1 *Scientists estimate rockets will carry men from the earth to the moon in 65 hours. At what speed will the rocket travel ?*

2 *After reading about changes in transportation some people often remark, 'The earth is getting smaller' What do they mean ?*

3 *Name and explain two very important events in the story of travel by land.*

4 *Tick answers given below (a to e) which make the following statement true :*

Man's legs are still the most important means of transportation in certain parts of the world because

(a) *men can travel where animals and vehicles cannot.*

(b) *tamed animals are not available.*

(c) *this mode of transport is the cheapest kind available.*

(d) *it is costly to build roads.*

(e) *men can carry heavier loads than animals.*

5 *Write a paragraph explaining why you would or would not like to travel by air:*

6 *Explain why you think the following statement is either true or false.*

The more we learn about other people and the way they live, the more likely we are to change the way we do certain things.

7 *The sentence on the next page has several endings. Some of the endings make the sentence true. Tick each true ending.*

Much of the tea grown in India is sold to people in other countries. If there were no ways of transporting the tea to other countries

(*a*) *fewer people would work in the tea industry.*

(*b*) *the tea worker would find it more difficult to travel to the tea plantation each day.*

(*c*) *some of the land used to grow tea would probably be used for other crops.*

(*d*) *India would have less money to buy things from other countries.*

Things to do

1 *List the advantages of land transportation, water transportation and air transportation.*

2 *Make a survey among your class members to find the following :*

(*a*) *The number of kilometres, members of your class travelled during the last school holiday.*

(*b*) *The longest trip made during the holiday.*

(*c*) *The number of students who travelled by the following vehicles: bicycle, automobile, truck, cart, train and airplane.*

13 World Routes

Ocean Routes

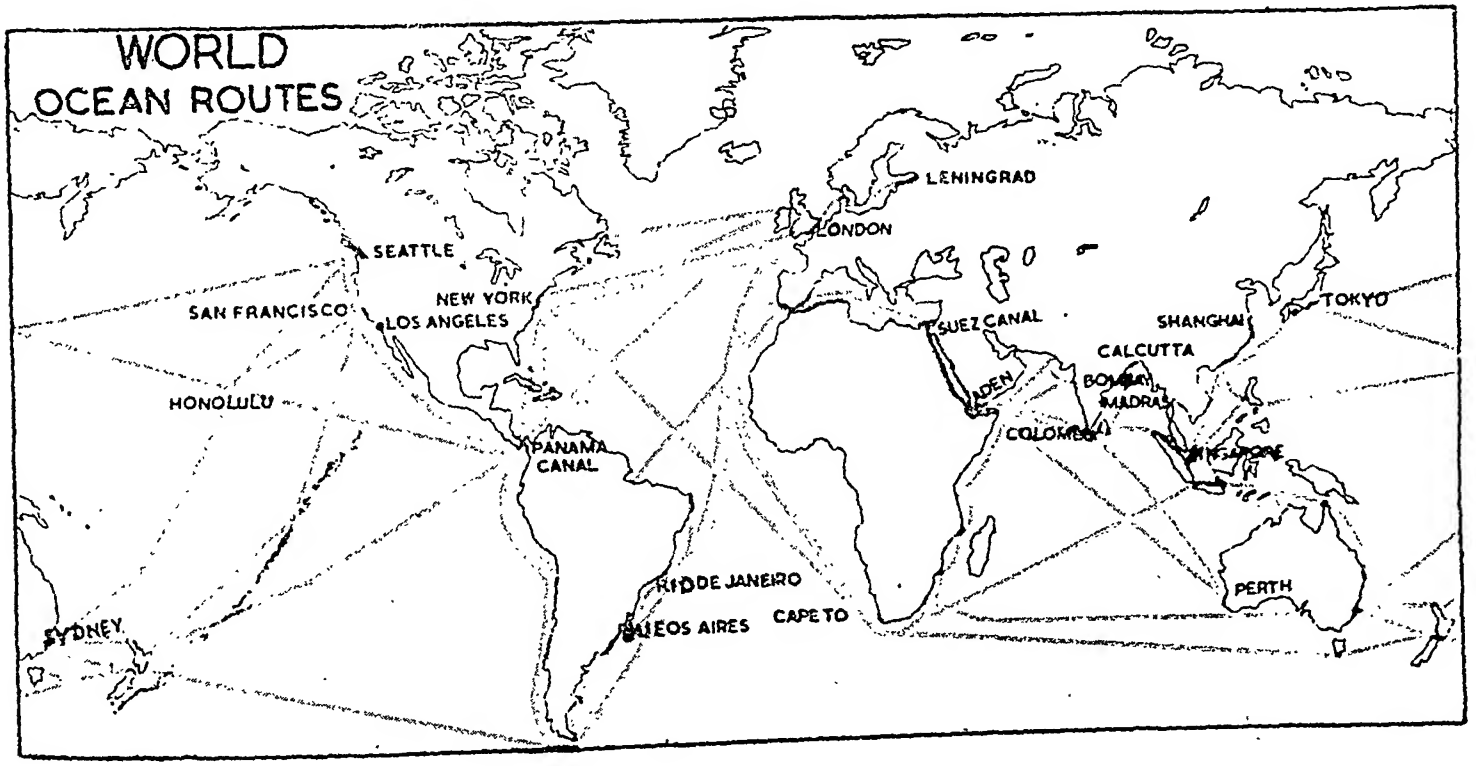
Most goods are carried from one country to another by water transportation. The map in Figure 26 shows major ocean routes between countries. The wide lines mean that more goods are carried on these routes than on routes shown by narrower lines.

Study Figure 26 and find the route carrying the greatest amount of goods. Which two continents does this route connect ? Note that the route between South America and Europe is the second widest route.

Also note the width of the routes leading to and from India's major port cities—Bombay, Calcutta and Madras. You can compare the width of these routes with other routes. But the actual routes of ships coming to and going from India are not shown.

Look once again at the world ocean route map, Figure 26 With your finger, trace two ocean routes from Bombay to London. Note that one route goes through the Red Sea and the Suez Canal. About 100 years ago, this route was not used. The Suez Canal which connects the

Fig. 26



Red Sea with the Mediterranean Sea had not been built at that time. All ships used the route round the African continent. This made the trip to the United Kingdom over 6000kilometres longer than the present Suez Canal route.

The Panama Canal is another important canal used by ocean-going ships. This canal is at the southern end of North America. The canal connects the Atlantic and Pacific Oceans. Ships travelling between these two oceans and using the Panama Canal do not have to travel around the southern tip of South America.

Can you find other places in the world where canals shorten ocean routes ? Why do you suppose canals have not been built there ?

Land Routes

The greatest number of railway and truck routes connecting different countries is found on the continent of Europe. Look at the world population map in Figure 13. Note that a large number of people live in Europe. These people live in a number of different countries. And each of these countries produces more of certain goods than it needs for its own people. Some of these extra goods are shipped to neighbouring countries over land routes.

The longest land route in the world is the Trans-Siberian Railway route. Not only does it connect a number of different countries but it also joins two continents, Europe and Asia. Most of this railway route runs through the Union of Soviet Socialist Republics. The Trans-Siberian Railway Route connects Vladivostok, on the eastern coast of the U.S.S.R. with Moscow, the capital city of this country. With the help of the scale given on the map in Figure 29 find out the length of this railway route. You will be surprised to know that this railway route is so long that a journey from Moscow to Vladivostok by the Trans-Siberian Railway takes about nine and a half days. This route makes it possible to transport goods from cities located on the eastern side of Asia to Moscow. From Moscow the goods are sent on to other countries and cities in Europe.

Recently in Europe and other continents, railway and truck transportation have been joined together. Trucks are so made that the part in which the goods are carried can be separated from the part which carries the engine and driver. These trucks are called **trailer-trucks** because the part which carries the goods trails behind or is pulled.

These trucks cover part of their journey by road. Then they are driven on to flat railway cars. The part in

which the goods are carried—**the trailer**—remains on the railway car. The part which carries the engine and driver—**the cab**—is free to pull another load. Trains transport the trailer to railway yards which are close to places where goods are to be delivered. At the railway yards a new cab is attached to the trailer on the railway car. Then it is driven off and the goods continue their journey.

Putting together railway and truck routes reduces the cost of transportation. It also reduces the time required to carry goods over long distances. It is another example of how men are trying to find better ways of transporting goods.

Air Routes

Air routes are the most direct routes. The shape and location of continents do not affect them. Neither does the height of most mountains.

One thing which does affect air routes is the distance airplanes can travel without landing for fuel. However, even this is not a problem today as it was a few years ago. Some attempts have been made in which an airplane while flying in the air is supplied with fuel by another plane. This enables the airplane to go on its flight without having to land for fuel. Today, a large number of passenger and cargo planes travel non-stop 10,000 to 11,000 kilometres without landing on the ground.

Figure 27 shows major air routes between countries all over the world. Airplanes of many countries fly on these routes. Airplanes of Air India-International also fly on these air routes. Find the most direct route from Delhi to London. How many other routes to London can you find?

Questions to answer

1. *Answer the following questions :*

   (a) Which are the two countries from where India buys and also to which she sells most of her goods ?

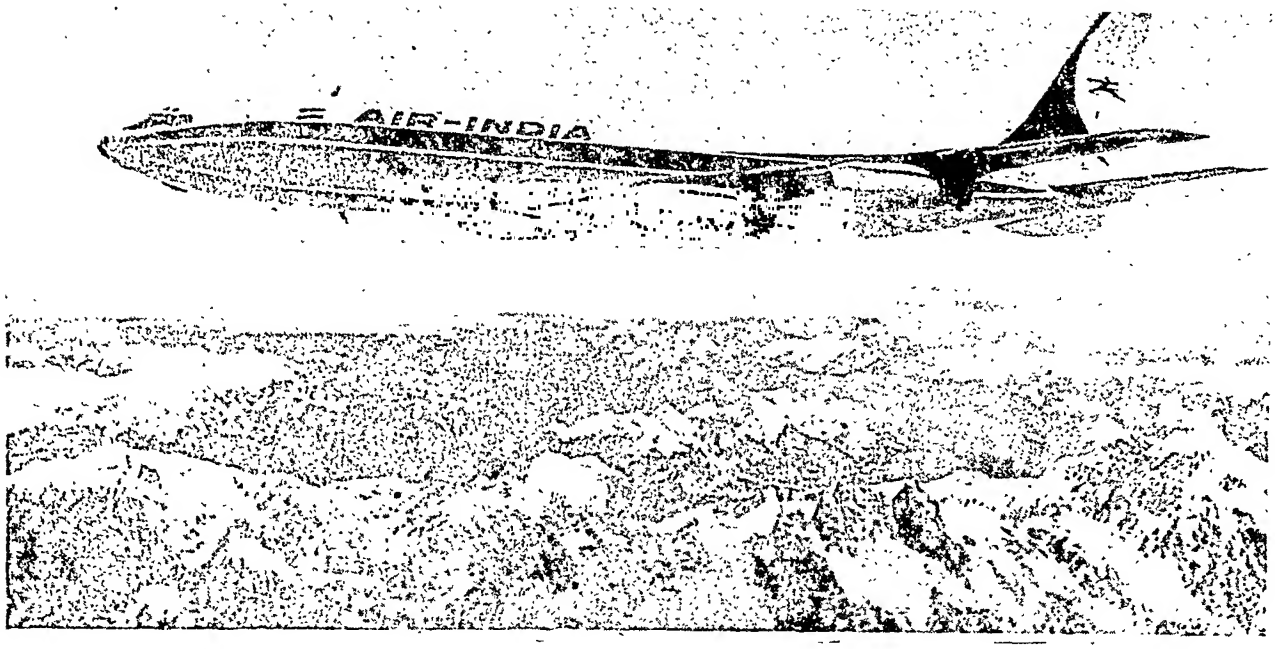
   (b) Which country of Asia is the leading seller of her goods to us ?

   (c) What country located to the east of us is our biggest customer ?

   (d) Name the two countries which purchased more goods from us and sold less of their goods to us.

Trailer-train : A single wagon of this goods train can carry fifteen cars at a time.

These trailers full of goods are being carried on open flat wagons of a goods train to the railway yard which is close to the place where goods are to be delivered. There they will be attached again to a new cab which will pull them on the roads.



You can see from this picture that today airplanes can fly over the highest mountains.

Here is a very big airplane supplying fuel to other four planes flying in the air. Notice the petrol tanks attached to the wings of the big airplane.

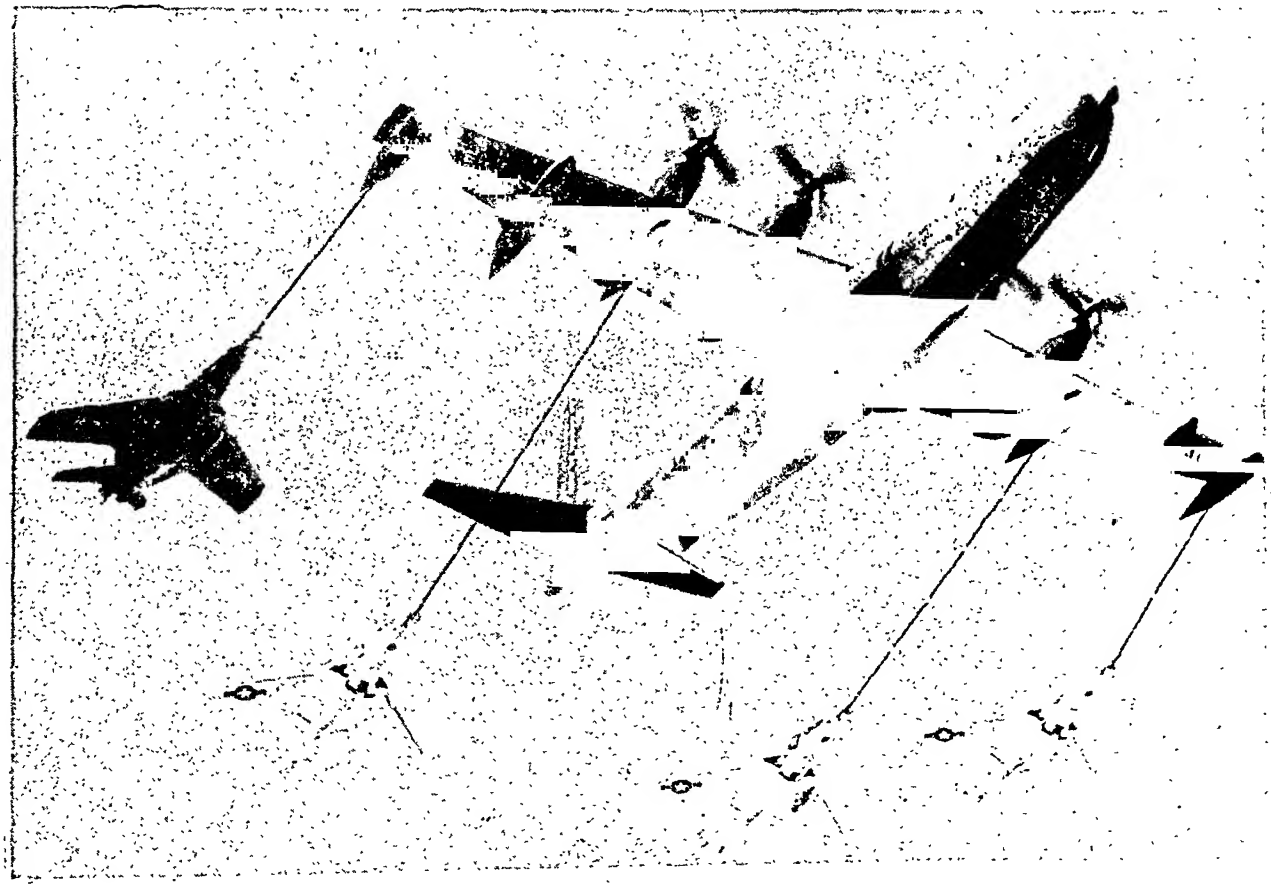
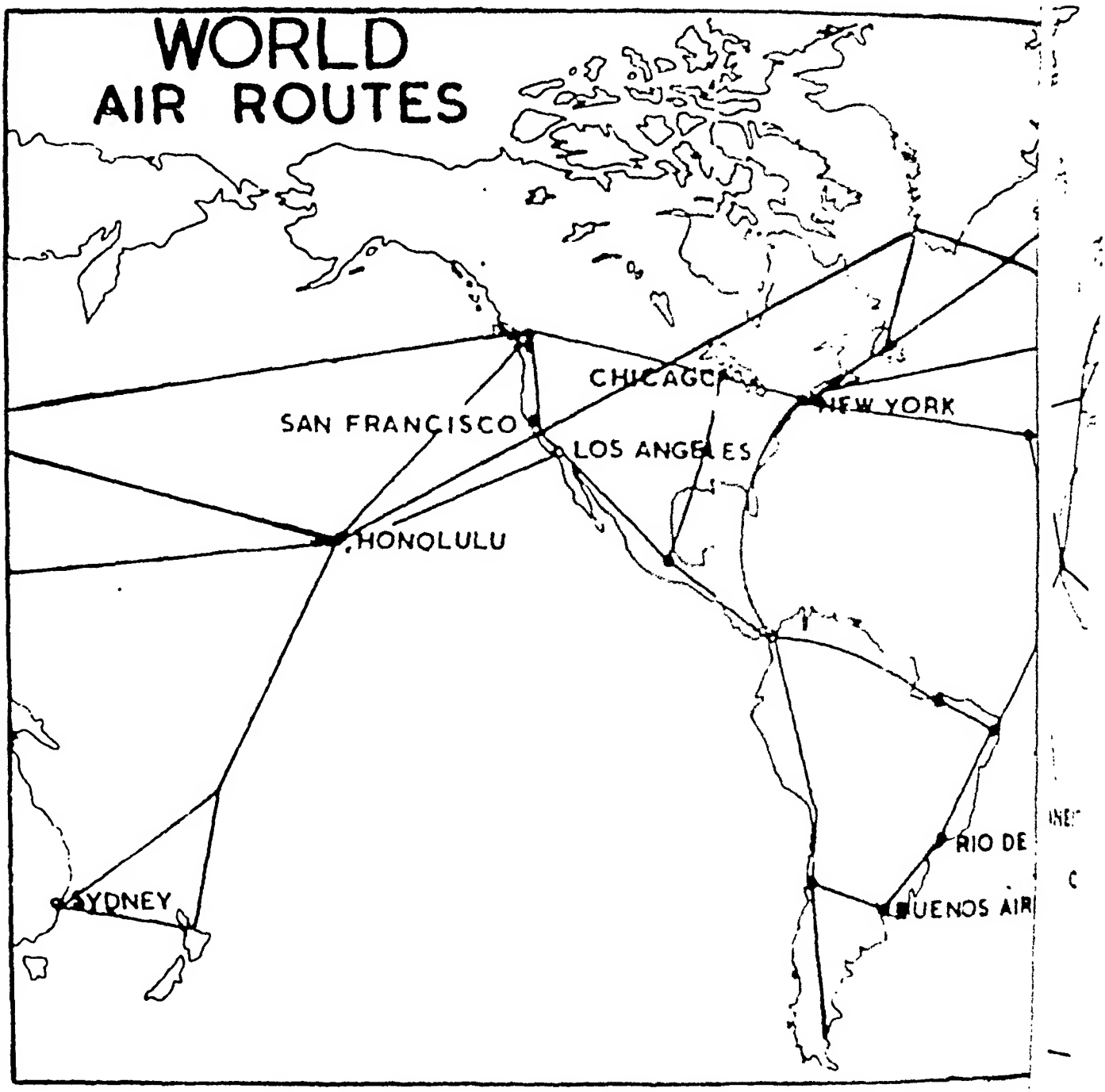
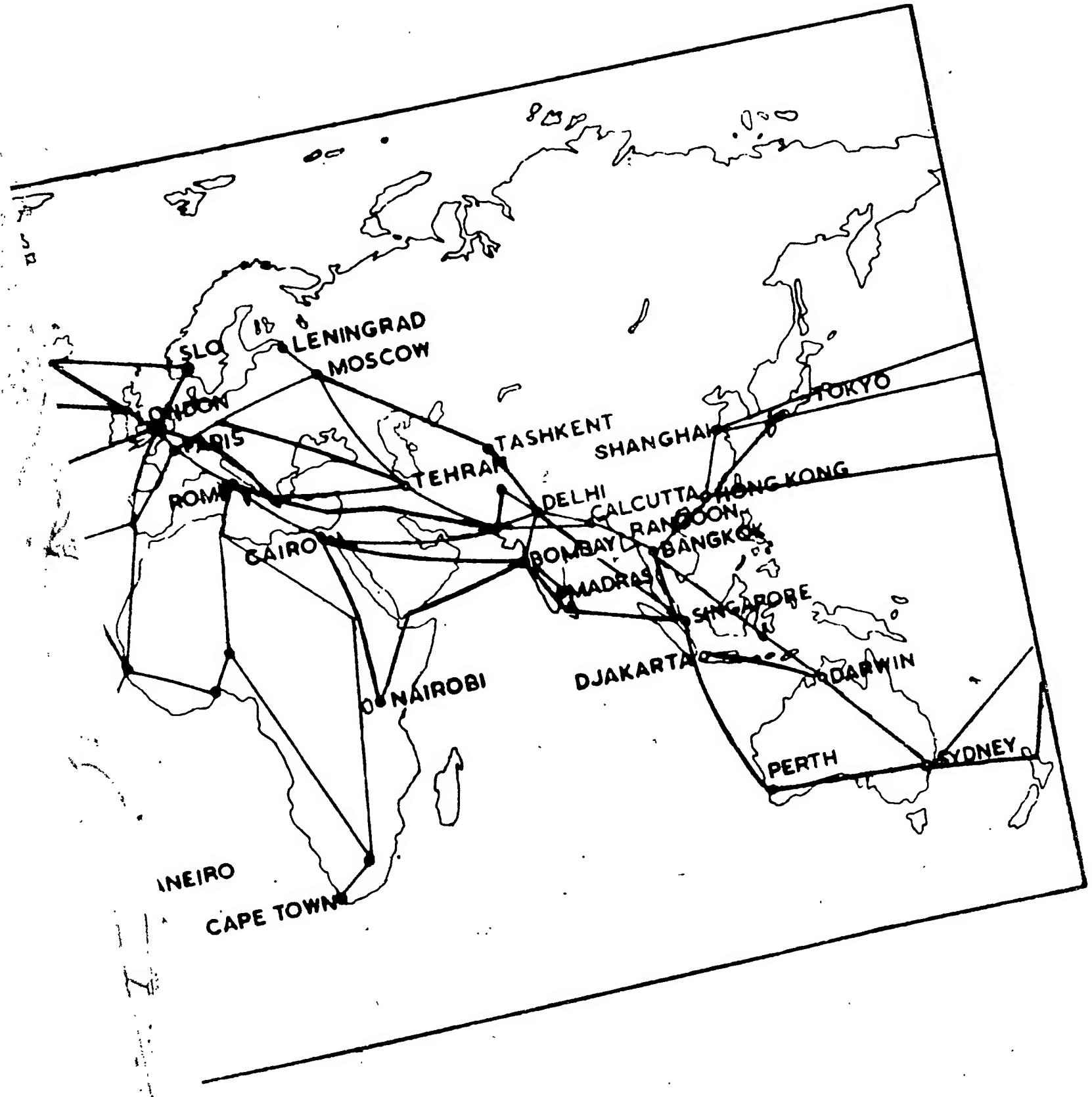


Fig. 27


WORLD
AIR ROUTES
SAN FRANCISCO
CHICAGO
NEW YORK
LOS ANGELES
HONOLULU
SYDNEY
RIO DE
BUENOS AIR


LENINGRAD
MOSCOW
TOKYO
TASHKENT
SHANGHAI
TEHRAN
DELHI
CALCUTTA
HONG KONG
RANGOON
BANGKOK
CAIRO
BOMBAY
MADRAS
SINGAPORE
DJAKARTA
DARWIN
NAIROBI
PERTH
SYDNEY
CAPE TOWN

2. *Look at the world route maps in Figures 25 and 26 and answer the following questions :*

   (a) *Do the countries on the continent of Asia have as much ocean trade as the countries of Europe ?*

   (b) *Why do some ships carrying goods from India use the route around the continent of Africa to reach Europe ?*

   (c) *If you are to go to New York from Bombay by air, which air route would you like to follow ? Write the names of at least four airport-cities which would come on the route selected by you.*

3. *Compare Figure 13 with Figure 25. Would it be correct to say that countries with the greatest population have the largest amount of trade ?*

4. *Explain how carrying loaded trailer-trucks by train could reduce the cost and time of transporting goods.*

5. *Explain why air routes are the most direct routes.*

Things to do

Visit Palam Aerodrome with your teacher and find out to which countries the airplanes landing there belong.

14 Communication

There are two main ways in which we can communicate with others. We can speak to others, or we can put what we wish to tell others in a form that they can see and understand. The first way men communicated with one another was through speech. It was hundreds and thousands of years later that men put what they wanted to say in a way that others could see.

Even then they only drew on stones, weapons and walls of caves. Many more thousands of years passed before men found a way of putting their speech sounds in the form of a written language. And again thousands of years passed before the kind of paper we use today was invented.

Books, Newspapers and Magazines

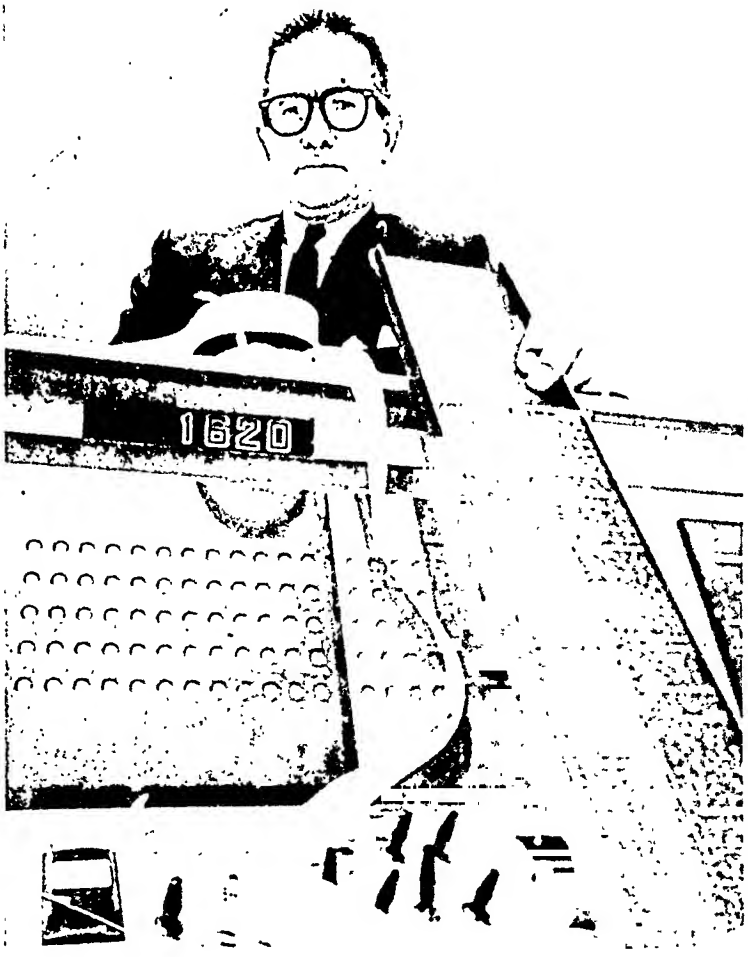
Today a written language and paper are very common. So is the printing press, a machine used to produce books, magazines and newspapers.

The first printing press was invented a little over 500 years ago. It was invented by a man named Gutenberg who lived in Europe. Gutenberg did not invent printing. The Chinese and other people had printed from wooden blocks many years earlier. They carved out into the wood blocks, forming letters of the alphabet. Then they used the blocks over and over again to make many copies of texts that they wanted to share with others.

Gutenberg invented a way of using movable pieces of metal shaped into letters of the alphabet. Then he invented a frame in which the metal letters were held in place. He put ink on the letters. Then he placed paper on the letters and he presssed a flat piece of wood against the paper. In this way, the ink was transferred from the letters to the paper.

The printing presses used today are very different from Gutenberg's press. Now men do not spend time selecting metal letters to be put in a frame. A machine which looks like a typewriter does this automatically. Today some printing presses can print as many as thirty-two pages of a book or magazine at one time. And they can also print on both sides of the paper at the same time. This means that sixty-four pages of a book can be printed at one time.

Many other improvements have been made in the printing process. All these improvements have made printed materials easier and cheaper



The picture shows a galley or tray of set-up type. The letter types in this galley have been set by the machine shown behind the tray.

to get. With this, more and more people are learning to read. As they learn to read, they become more and more interested in reading books, magazines and newspapers. This encourages printers to find new and better ways of producing printed materials.

Today it is difficult to think of living without printed materials. Schools without books would seem odd. A day or week without a newspaper or magazine would be just as odd for many people. And most of us would wonder how we could manage without printed money.

Books, magazines and newspapers are now a part of our daily life. They make it possible for many people to enjoy the writings of others. They are used by many people to increase their knowledge. Books from many countries can be purchased in India. And books printed in India can be purchased in other countries.

This is true of newspapers and magazines also. An Indian newspaper can be purchased in the capitals of most major countries only two or three days after it has been printed. And magazines from many countries are shipped all over the world. Through printed materials we are able to communicate with people living in different parts of the world.

Motion Pictures

Most people think of a cinema house as a place of entertainment. Few people think of it as a place where they can communicate with others. Yet motion pictures are an important means of communication. Through motion pictures we can learn a great deal about how others live. We can learn about their achievements, their problems, their beliefs and even the way they entertain themselves. Every

thing people do is shown through motion pictures.

Sometimes the information given is not accurate or it is misleading. Certain facts are not included. Or certain things are stressed so much that the film does not show life as it really is. This is done because those who make the film want to be certain that it will be entertaining. However, good motion pictures do present life as it really is. Hence they are not only entertaining, but they also communicate the ideas of others and present life as it exists all over the world.

More and more people realize the value of motion pictures. Many governments are encouraging their production. India is the second largest producer of motion pictures. Only Japan produces more. This tells us that the cinema house can be the place in which the people of India communicate with one another. It can even be the place where the people of the world communicate with one another because today motion pictures very often present life as it is lived in the various parts of the world.

Postal Service

The people of the world also communicate with one another through letters. Most people know about postal services. However, many do not realize that these services extend to most parts of the world. You can purchase with one rupee and sixty paise an aerogramme or air mail letter from any post office in India. This letter can be sent by air to any country of the world. Air mail letters from India reach the continent of Europe in three days. They take only four days to reach the continent of North America. Such quick delivery is possible only through the cooperation of governments and postal workers all over the world.

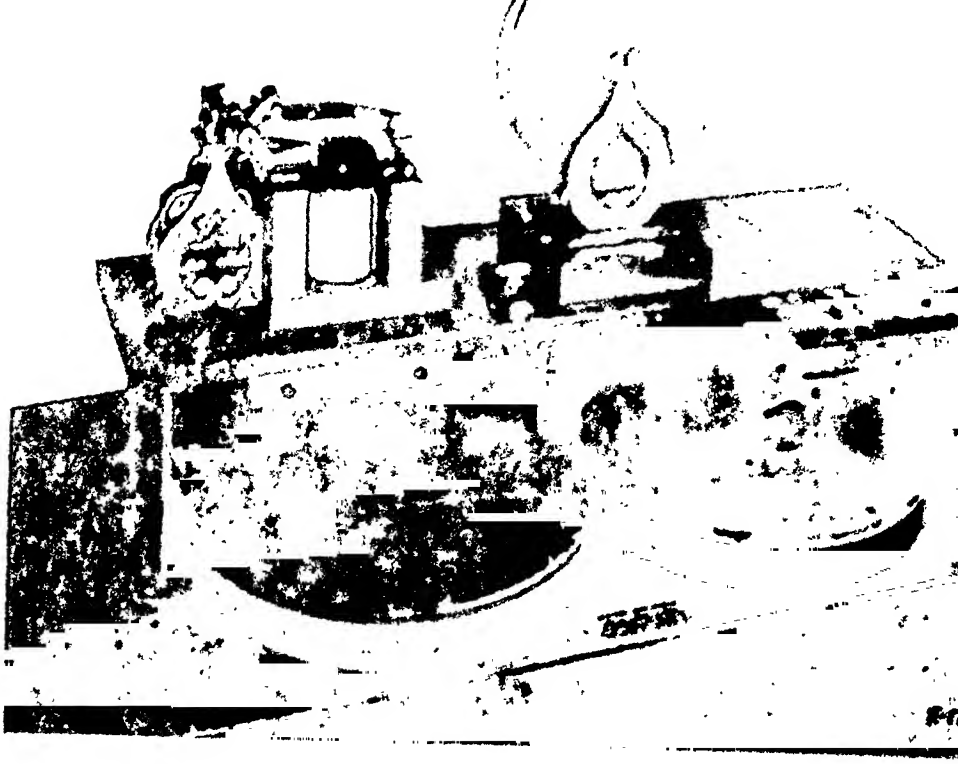
Telegraph and Telephone Service

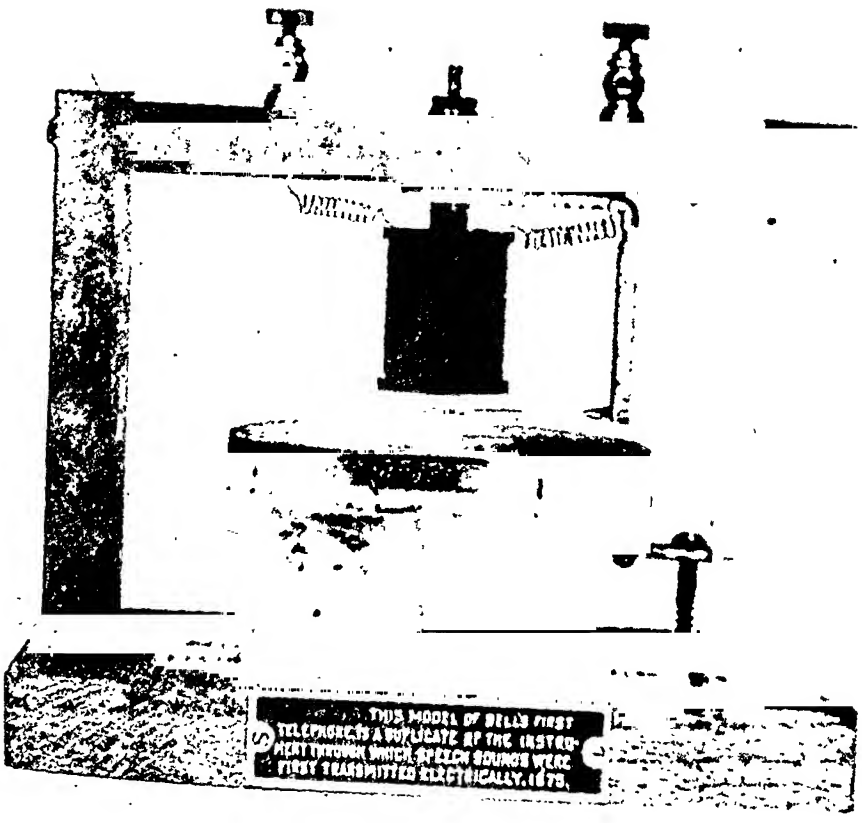
When faster service is needed, you can send a telegram to other countries. A telegraphic message can be delivered halfway round the earth in two hours.

The first telegraph machine was a simple one. It was invented by Samuel Morse about 130 years ago. Mr. Morse's telegraph machine was based on the knowledge that electricity travels through wires. The machine stopped and started the flow of electricity through wires. This produced a buzzing or clicking sound.

Morse put together a different group of clicking sounds for each letter of the English alphabet. In this way he was able to send coded messages across the wires.

This is the model of Morse's first telegraph machine. Morse sent the first telegraphic messages by this machine in 1844. Compare this telegraphic machine with a modern machine.





This is the first model of a telephone machine invented by Alexander Graham Bell. Man's voice was sent for the first time to a distant place by this machine in 1875.

Morse's sounds or Morse's code, as the sounds are called, are still used today. However, many countries now use an automatic printing telegraph. This machine looks like a typewriter. It prints the letters of the alphabet instead of producing coded messages.

The telephone was invented by Alexander Graham Bell about ninety years ago. Like the telegraph, it is based on the knowledge that electricity travels through wire. However, the telephone does not stop and start the flow of electricity. Instead it changes the strength or amount of electricity which flows through a wire. The change in the amount of electricity produces the sound of a person's voice.

Today telegraph and telephone wires connect many countries. Wires are stretched above the surface of the earth with the use of poles. Sometimes wires are placed underground. Telegraph and telephone wires have also been laid under the deep waters of most oceans. Countries separated by large oceans are now connected by telegraph and telephone wires.

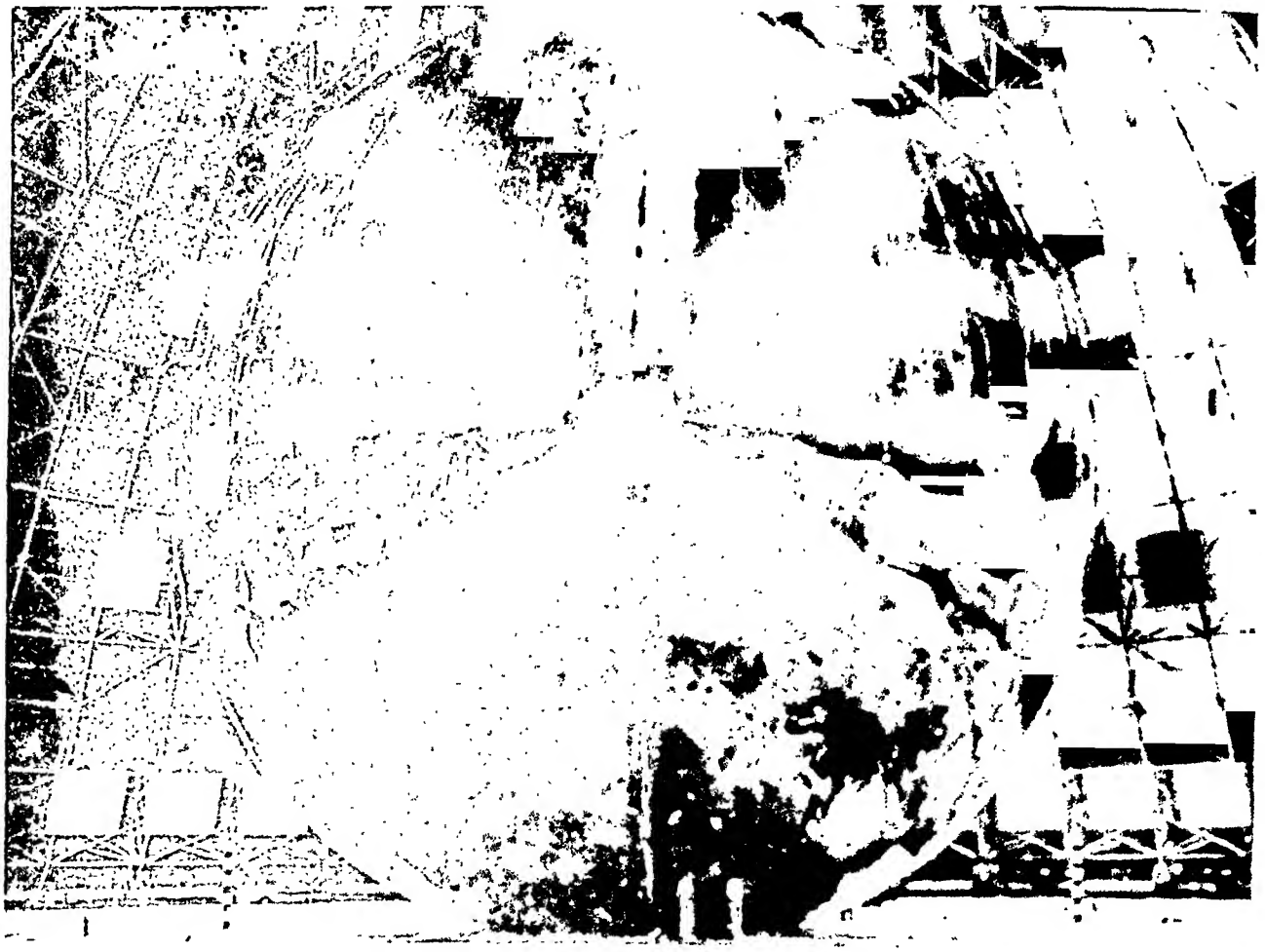
Also, new inventions now make it possible for one wire to carry messages of many people speaking at the same time. As a result, the telegraph and telephone are used daily to exchange information between people living in different countries and on different continents.

Here Alexander Graham Bell is demonstrating his telephone in an exhibition. Compare this telephone machine with the modern machine.

Radio and Television

Today you can telephone someone in another country without the use of connecting wires. The radio is used to carry your voice. Your voice travels through wires to a radio station. There, it is sent through the air to a point where it can once again travel through wires.

Most people use the radio to entertain themselves. However, the radio also helps us to communicate with others. It is used to send news from one country to another. It helps us learn about the music of people living in other countries. The radio helps us to learn what people in other countries are thinking and doing. It



The picture shows a man-made satellite, popularly known as Communication Satellite. It was sent in space for world-wide communication. Estimate the size of this satellite with the help of the height of men standing in the picture.

is even used to send photographs from one country to another.

Radio communication is also important to the safety of travel by water and air. Ocean-going ships receive weather reports by radio from countries located along their routes. Sometimes ships send radio messages requesting help from nearby countries, or other ships. Communication by radio is also important to the safety of airplanes. Airplanes send and receive radio messages as they fly from one place to another. Radio messages to pilots from airport control towers are used to give directions during the landing and take-off of airplanes.

Even more helpful is the newest invention which helps us to communicate with others, the television. Television makes it possible to see what people are doing as well as to hear what they are saying.

At present only a few homes and schools in India have television sets. Television programmes are arranged from several television centres which

cover a large part of the country. In a few years, programmes from other parts of India will also be shown on television.

World-wide Communication

Today, we see several important television programmes from other countries also. This has become possible because of a new invention. A way has been found to place a number of small machines high up in the sky. These machines are called **Communication Satellites.** They can send out radio-telephone calls, telegraph messages and television programmes. These are sent on to other similar machines located at different places high above the surface of earth. Or they are passed on to stations located in different countries of the world. Form there, the messages and pictures are sent on to television sets, telephones and telegraph offices.

Sending pictures and messages through satellites located high up in the sky requires a great amount of work. Many people must be employed to build and operate the equipment. Many more must be employed to keep the equipment in good condition. This can be done only if people from many countries work together.

Actually people from about fifty countries have joined together to make this scheme successful. India is one of these countries. The work done by India and the other countries has made communication even easier. Therefore, it is easier to trade with others. Travel between countries by ship and airplane is safer. It will be possible to communicate with many more people from other countries. We will learn more about the way other people live, and others will learn more about us. It will help people learn how to work together more effectively.

Questions to answer

1 *Why is it important to communicate with people of other countries ? List as many reasons as you can think of.*

2 *List all the possible ways in which you can send a message from your town to Japan. Which is the fastest way ?*

3 *After reading this chapter some people said, 'Better and easier communication makes it seem as if our world is getting bigger' Explain what they meant.*

4 *Why are telephone messages to some countries sent by radio ?*

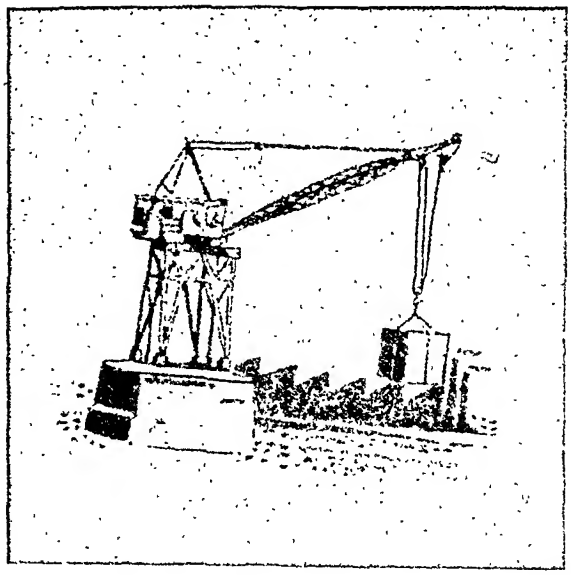
5 *What important information about electricity made it possible to invent the telegraph and telephone ?*

6 *Which means of communication studied in this chapter has affected our lives most ? Why ?*

Things to do

1 *Visit with your teacher the Delhi station of All India Radio and find out the different kinds of programmes relayed from there.*

2 *Send a telegram from a nearby telegraph office to your friend to felicitate him on passing his examination.*



TWO BIG INDUSTRIAL COUNTRIES

New and better means of transportation and communication are not the only things that can change the way people live. The way people produce their goods can also affect their lives. You will learn why this is true when you read the next two chapters, about the Union of Soviet Socialist Republics and the United States of America.

These two countries are highly industrialized. That is, a large number of the people there work in mines, factories, and business concerns of many kinds. Also, they use many machines in their work.

In countries that have many industries, a large number of people live in cities, where the industries are located. They are no longer so close to the land and the sea as people in some of the countries you have read about. Usually they do not work so hard because machine do much of the work for them. They also produce more goods in less time and have more hours of leisure.

People who work in industries have to have skills and knowledge of many, many kinds. This is one of the reasons why schools and education are considered important in the two countries you are about to study.

15 The Union of Soviet Socialist Republics

Size of the U. S. S. R.

The Union of Soviet Socialist Republics is popularly known by its smaller name as the Soviet Union or the U. S. S. R. You can find out from the world's political map in Figure 12 that the Soviet Union is the largest country in the world. This country covers one-sixth of the world's land surface. With the help of the scale given on the map in Figure 28, find out the maximum length and breadth of the Soviet Union in kilometres. Now compare these figures with those of our country given on page 64. Which of the two countries is bigger ? In fact the area of the U. S. S. R. is so big that about seven countries of the size of India could fit within the borders of the Soviet Union.

The distance between the eastern-most border and the westernmost border of the Soviet Union is about nine thousand kilometres. From the map in Figure 28, find out the number of meridians in which this country is stretching. The U. S. S. R. is so vast a country that you would be surprised to know that when it is early morning, say 5 a. m. on its western border, it is already 4, o'clock in the evening of the same day on its eastern border.

Look at Figure 28 again and find the Ural Mountains. These mountains are located at about the 60°E meridian. Most people think of these mountains as the natural border between the continents of Asia and Europe. These mountains divide the Soviet Union into its Asian and European parts. No other country in the world stretches across such a wide section of two continents.

Climate of the U. S. S. R.

Such a large country is bound to have many different climates. Look at Figure 28 again and answer the following questions. Why do the regions along the Arctic Ocean have cool summers and very cold winters ? In what regions of the country are the major mountains located ? What effect will these mountains have on climate ? In what parts of the U.S.S.R. do you find a desert area.

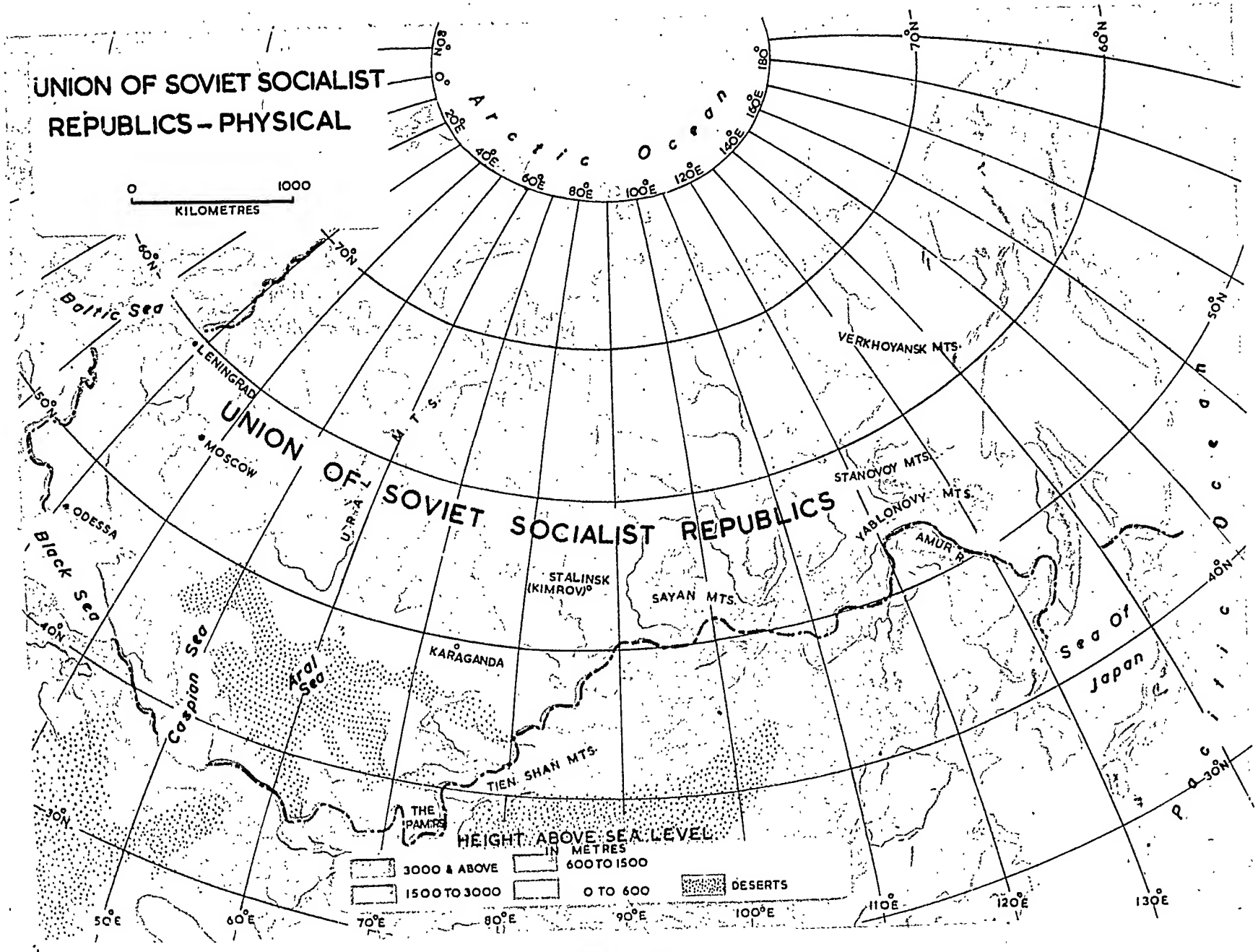

UNION OF SOVIET SOCIALIST REPUBLICS – PHYSICAL
0
1000
KILOMETRES
Arctic Ocean
Baltic Sea
Black Sea
Caspian Sea
Aral Sea
Sea Of Japan
Pacific Ocean
LENINGRAD
MOSCOW
ODESSA
KARAGANDA
STALINSK (KIMROV)
SAYAN MTS.
VERKHOYANSK MTS.
STANOVOY MTS.
YABLONOVY MTS.
AMUR R.
TIEN SHAN MTS.
THE PAMIRS
URAL MTS.
UNION OF SOVIET SOCIALIST REPUBLICS
HEIGHT ABOVE SEA LEVEL IN METRES
3000 & ABOVE
1500 TO 3000
600 TO 1500
0 TO 600
DESERTS

Fig. 29

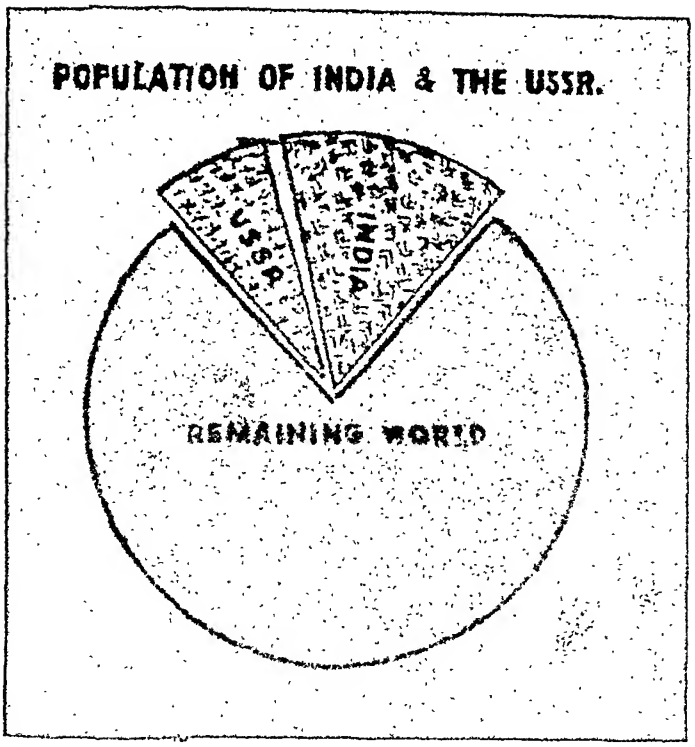


Fig. 29

The Soviet Union's southernmost border is about 4800 kilometres from its northernmost border. As a result, there are great differences in the temperature between the northern and southern parts of the country. The part in the extreme south has a crop-growing season of about six months. Some parts of the northern region are too cold for growing crops at any time of the year.

People of the Soviet Union

Although the Soviet Union is the largest country in the world, nearly twenty seven crores of people live within its borders. Figure 29 will help you to compare this number with the number of people living in India. In this figure, a full circle represents all the people living on our earth. Note the sizes of the two parts of the circle which stand for the number of people living in India and the Soviet Union. The part which represents India's population is more than twice the size of the part which represents the Soviet Union's population.

This large country is made up of many different kinds of peoples. Peoples known as Russians, Lithuanians, Uzbeks, Tartars, Mongols, Turks and Ukranians are all citizens of the Soviet Union. Many years ago these peoples differed greatly from each other. They lived in different parts of the Soviet Union and the distance kept them separated from one another. They wore different kinds of clothing. They ate different kinds of food. And they even spoke different languages.

Today, the differences between these peoples are much less than they were. All these peoples speak Russian, the language used in all the schools of the Soviet Union. Now because of good railway and air transportation, and good communication system, these peoples have much more contact with one another than before. This tends to make them more alike. Also, the Government of the Soviet Union has started many industries in the various

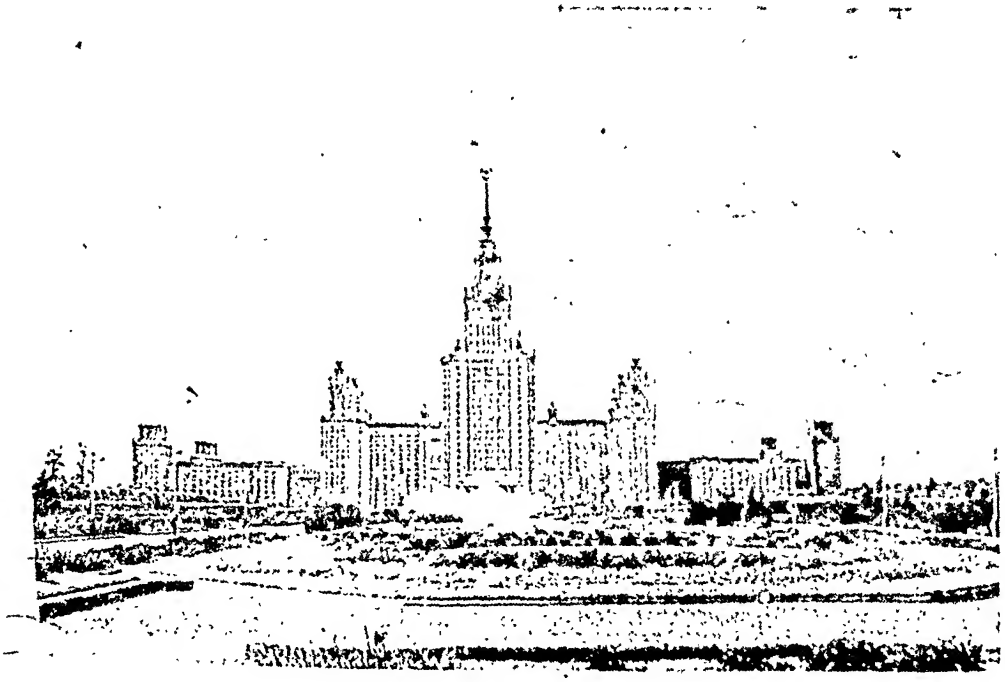
parts of the country. More and more of them live in large cities. This also tends to make them alike. In cities they live close together and work together in the factories.

The changes in the Soviet Union have been most rapid during the past fifty years. Before then, the different peoples were governed by a Russian ruler, known as the Czar. The Czars did little to help the people, and their laws were so strict that most people found them unhelpful and cruel. Finally, conditions became so bad that in 1917, the people revolted against their government. The people used force to get rid of the man who was then Czar. Then they established a new government.

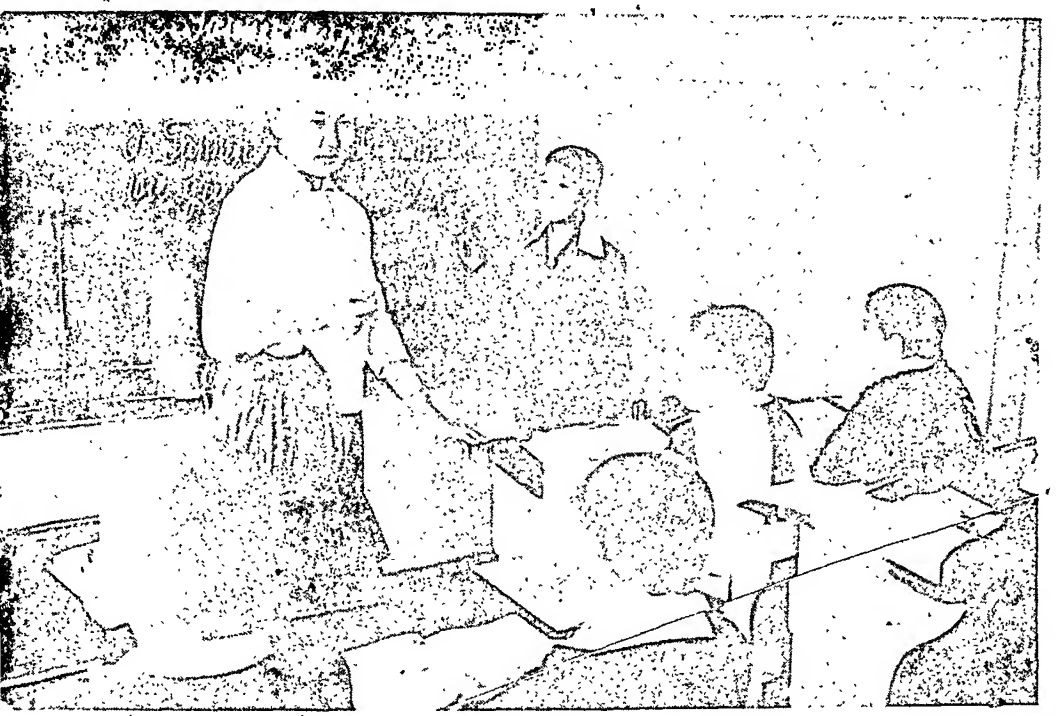
It was in 1917, therefore, that the Union of Soviet Socialist Republics was formed. The country was divided into fifteen parts or states called Republics. The officials for these Republics and for the Government of the Soviet Union are always chosen from one group or political party. This group is known as the Communist Party. Its members believe that the government should own all land, factories and stores. They believe that this is the best way all people can share the country's wealth.

Education in the Soviet Union

One of the first things the new Soviet Government did was to provide schools for all the people. The officials knew that the poor conditions in the country could not be improved unless all people had some education. Under the rule of the Czars only 26 per cent of the people could read and write. Today 98 per cent of the people can read



Moscow University is located on a hill. It is one of the world's famous universities. Students from all over the Soviet Union and also from various countries of the world come here to study.



A Russian lady teacher is teaching the German language in one of the schools of the Soviet Union. In schools of the U.S.S.R. foreign languages are taught besides the country's languages.

and write. The U. S. S. R. has very good schools, and every child can get an education. The U. S. S. R. also has good universities and some of the best scientists in the world.

Soviet Industry

During the past fifty years, the Soviet Government has started many new industries. These industries produce all kinds of goods. As a result, the Soviet people are now able to buy many things which were not available to them before. There is a greater amount and variety of clothing to buy. Certain foods are more plentiful. Television sets, automobiles, and electrical household appliances are used by more people. And it is important to remember that machines are used to produce all these goods.

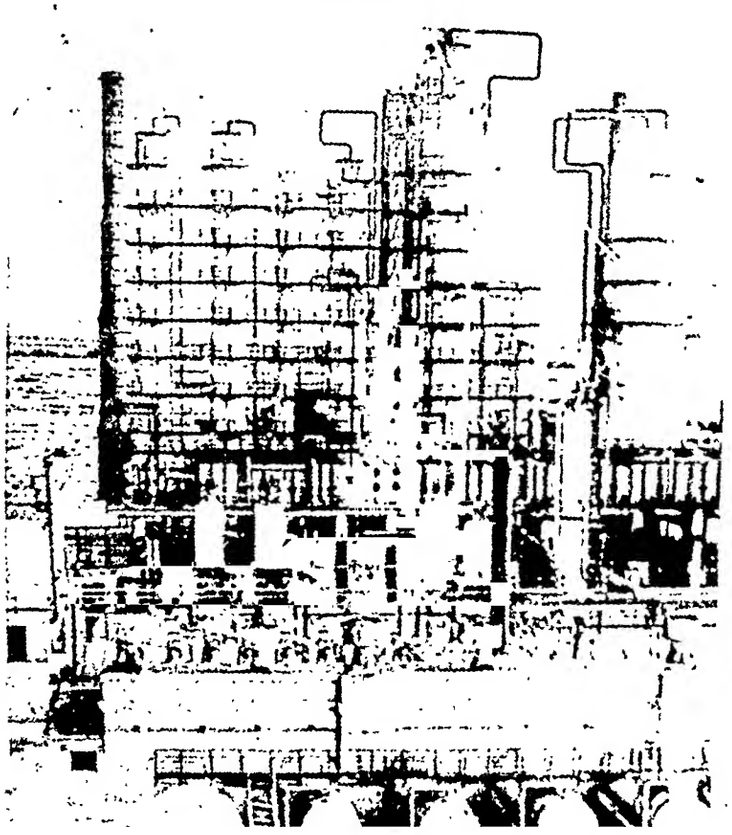
One reason why more machinery can be used in the Soviet Union is the greatly increased production of iron and steel. New iron and steel mills have been started in all parts of the country. Factories have sprung up in places where at one time very few people lived. The government has directed its scientists to explore all the barren, unused land east of the Ural Mountains, the area called Siberia. Large amounts of minerals, especially iron ore and coal, have been discovered there.

Look at Figure 28 and find the following places Karaganda, between the 70°E and 80°E meridians and about the 50°N parallel ; Stalinsk (Kimrov) between the 80°E and 90°E meridians and between 50°N and 60°N parallels ; Amur River, between the 120°E and

140°E meridians and between 40 N and 60°N parallels. Coal and iron ore deposits have been discovered near these places. That is why industries have been built. What was once unused land is now used in the production of all kinds of goods.

Although the Soviet Government has started new industries in the eastern part of the country, the greatest number of people still live in the western part. Look at Figure 28 again. With your finger trace a line through the cities of Leningrad, Odessa, Stalinsk (Kimrov) and back again to Leningrad.

This is a picture of a portion of the Soviet Union's largest oil refinery.



In a factory these tractors are ready to be transported to cotton farms.

Note that you have traced a triangle. The land within this triangle contains the greatest number of the Soviet Union's people. It has the largest number of railway lines and roads. It is the area which produces most of the Soviet Union's agricultural and industrial products. This productive area is often called the Soviet heartland.

Thirty or forty years ago the Soviet heartland covered a much smaller area. At that time many people thought the triangle could never expand. They thought the climate east of the Ural Mountains was either too cold or too hot. They thought the land was too poor to support many people. These difficulties did not stop the Soviet Government from finding ways of using the land for the country's benefit. If the U.S.S.R. continues to

use its land wisely, the Soviet heartland may become even larger than it is today. Some people think that thirty years from now, Russia's productive area may reach all the way to the Pacific Ocean.

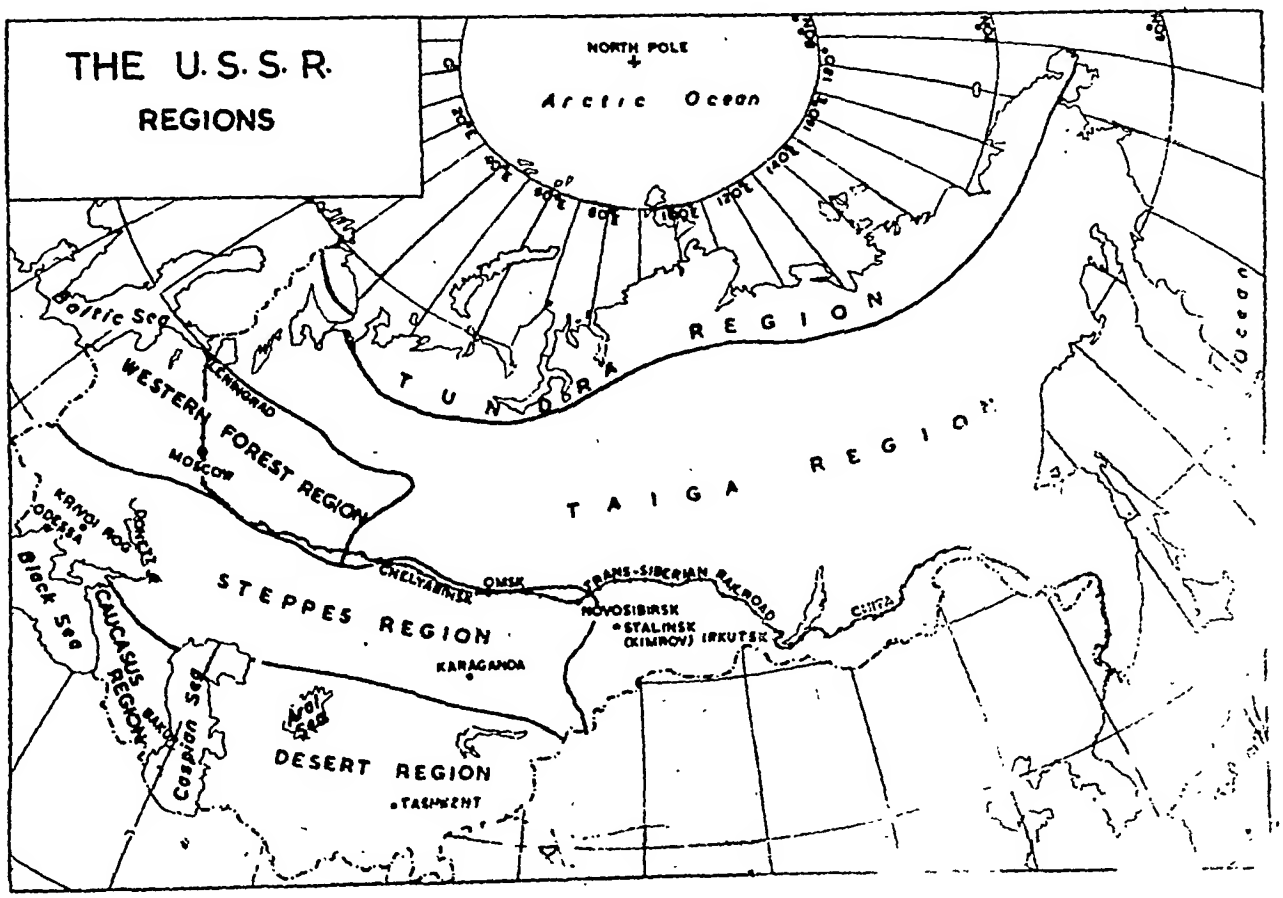
Tundra Region

Figure 30 is a map of the Soviet Union showing the country divided into six regions. You can see a narrow piece of land stretching across the Soviet Union's northern border, known as the Tundra region. The Tundra is a treeless area. Plants in the area never grow big. The winters here are cold and long, sometimes lasting for nine months. The temperatures even during the short summer season are too cool for most crops. Few people live in this area. Those who do live there settle along the sea coast.

Taiga Region

Many more people live in the area to the south called the Taiga. This is a large area with many trees. It is the biggest forest area in the world. The trees of this forest are of the ever-green, cone-bearing variety—pine, fir and spruce. This area has very cold winters. It is so cold that the sub-soil, or soil underneath the top layer, is frozen throughout the year. In mid-winter, temperatures of 50 to 60 degrees below zero centigrade are common.

Fig. 30



Even though this area is very cold, people are now moving into certain parts of the Taiga Region. Minerals have been discovered, and so new industries have been started.

The people, who live in the Taiga Region, but away from the new industrial areas, live along the banks of the great rivers or along the few railway lines in the area. The people living here are wood men who cut trees, miners who dig coal and metal ores in the hills and mountains and fur trappers and hunters. All these people work hard to get the maximum benefit from the land.

Hunting of fur-bearing animals in the Taiga Forests. Skin of fur-bearing animals is used for making clothing in cold countries like the U.S.S.R.

Western Forest Region

Moscow is the capital city of the Soviet Union. It is located in the Western Forest Region. Moscow is a fast-growing city. Now there are more than sixty nine lakhs of people living in Moscow and the government has put up many new apartment buildings to house all these people. These new apartments often surround villages which were once outside the city.

If you took a trip through the city, you would learn much about the people and the way they live. Gorky street is a main shopping street in Moscow. On this street you would see women busily sweeping the street—or shovelling off the snow, if it is winter time. More than one-half of the workers in Moscow are women. In fact as many as three out of every four doctors in the Soviet capital are women. Many other women work in the factories, schools, offices and stores located in the city.

Almost everyone on Gorky Street wears a fur hat in winter. They also wear heavy woollen coats, some with fur collars. This kind of clothing is needed to keep warm during the winter season. On street corners, people buy things from little shops—cigarettes, theatre tickets, biscuits, and fruit flavoured drinks.

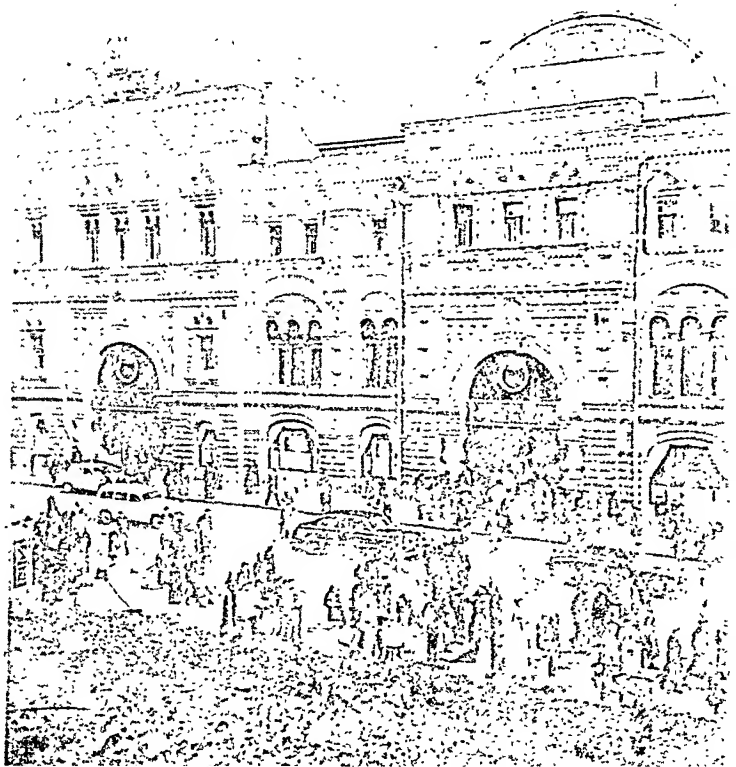
There are number of bigger shops on Gorky Street. All kinds of goods are sold here. The goods are arranged neatly and attractively. People are often tempted to stop and look at the displays. Unlike the shops in India none of the shops have a name. The shops in Russia merely have the name of the goods which are sold inside. They have such signs as 'Book Store No. 200', 'Shoes,' 'Wine', or 'Grocery Store No. 35.'

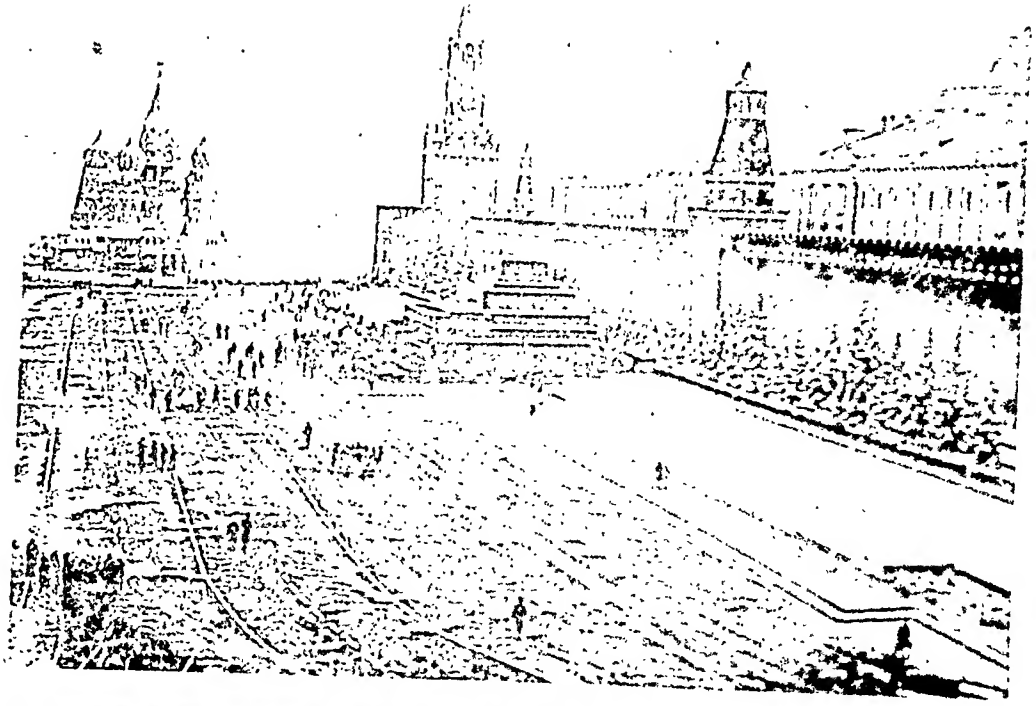
At the end of Gorky Street is the famous Red Square. This is the large area where many important public meetings and parades take place. On one side of Red Square is a high brick wall. It is a part of the wall which surrounds the world famous Kremlin. Kremlin is a Russian word which means citadel or fortress.

The Kremlin covers about sixty-five acres. Within its walls are a number of buildings. Most of these buildings were built before the Union of Soviet Socialist Republics was formed. They were built by the Czars of the old Russian empire. Three large churches in the Kremlin built by the Czars are now used as museums. Other buildings provide office space for government officials and meeting rooms for members of the Soviet Communist Party.

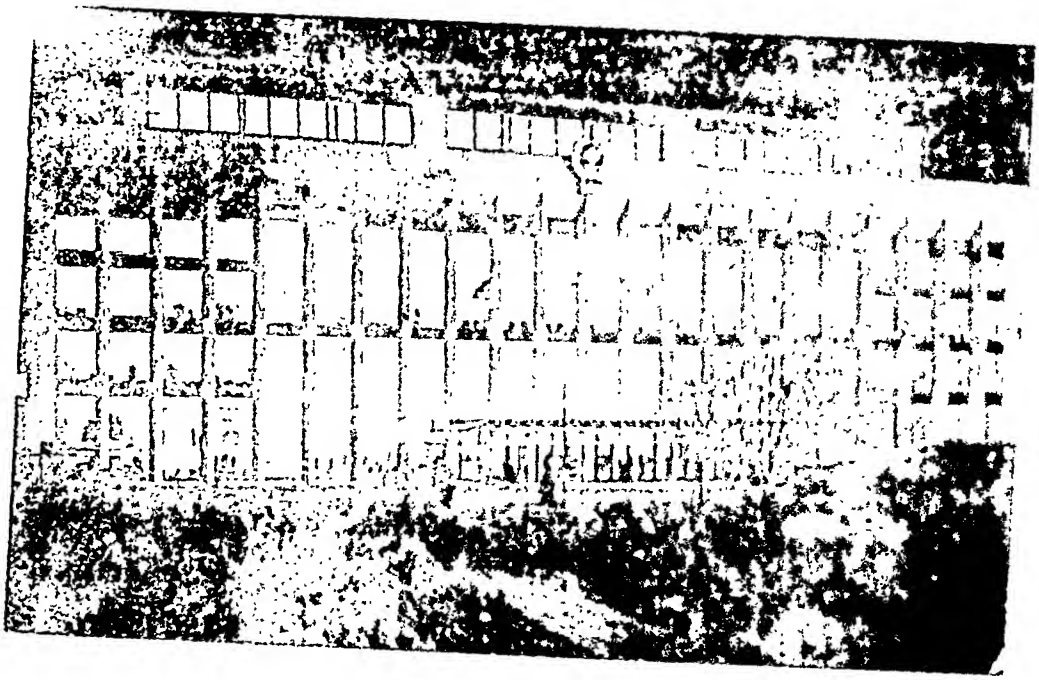
From the Kremlin it is easy to travel to the different parts of Moscow. Many people use the big and attractive sub-way or tube system of transportation. People enter the tube at street level and are taken to stations on automatic moving stairways. You can travel on these stairways to stations that are as much as forty metres below

It is the biggest department store or government shop in Moscow city. This store is like the Super Bazar of Delhi where all kinds of articles, cheap and costly are sold.





Red Square, Moscow. On the right, behind the wall, is the world famous Kremlin. In the background, on the left, is the old St. Basil's Church which is now used as a museum. Notice the snow on the road and on the leaves of plants.



This is the presidium or parliament building of the Soviet Government where the various laws of the country are made. This building is also a part of the Kremlin.

street level. The trains which run in these underground tubes are modern and fast.

If you would rather ride on the city's streets instead of travelling under them, you can use buses or taxis. On a bus trip, you can see many palaces, museums, theatres and libraries near the centre of the city. The Russian people are famous for their theatres, especially those in which ballets are performed A ballet is a form of dance which tells a story. The Bolshoi Ballet of Moscow is famous throughout the world.

Metro Station at Moscow. This is a station of the underground railway or sub-way. Moscow's underground trains are very attractive and world famous.

Away from the centre of the city are two large outdoor stadiums and the large Moscow State University. Also, many large factories have been built away from the centre of the city in an industrial district. Railway and locomotive shops, automobile and farm machinery factories, as well as factories for making textile, shoes and electrical goods are located in the capital city.

Not far from Moscow you can find forests of Birch, pine and oak trees. These kinds of trees are found throughout the Western Forest Region. This region is also noted for its potatoes, other vegetable flax, sugar-beet and rye. All these crops can grow in a cold weather and in the soil found in the Western Forest Region.

Study the Figure 28 and see the location of Leningrad. Located on the Baltic sea Leningrad is an important port of the Soviet Union. Most of the Soviet Union's trade with the other countries of the West is carried on through this port. The population of Leningrad is more than thirty five lakhs and in this respect it is the second largest city of the U. S. S. R. Leningrad was the capital of the Russian Empire during the time of Czars. Several factories are located in this city. The ship-building industry of Leningrad is very famous.

Steppes Region

The Russian word for plain is **steppe.** On the steppes huge fields of wheat and open grazing lands for cattle spread as far as you can see. Most of the area has black, fertile soil. But the rainfall is scanty and uncertain in many areas. Farmers here work on large farms owned by the government. Most of the farmers use a small plot of land in these farms to raise their own vegetables, apples and melons. Sometimes they take the extra produce from these plots and sell it in a nearby town.

Farming on the steppes is becoming more and more mechanized. That is, many machines are used. In an effort to increase production, the farmers also use more fertilizer than ever before. The steppes are the Soviet Union's main agricultural area and many other parts of the country depend upon this region for their food. That is why the Soviet Government is doing everything possible to increase agricultural production on the steppes.

A Soviet dancer of the world famous Bolshoi Ballet.

The steppes also contain some of the Soviet Union's largest mineral deposits. Look at Figure 31 and find the city of Krivoi Rog and the river Donetz. They are located just north of the Black Sea. Large deposits of iron ore are mined in the area around Krivoi Rog ; and in the valley of Donetz river large quantities of coal is mined. This area also has the world's richest deposits of manganese. Manganese is one of the minerals used in making steel.

The steppes now contain big, new steel mills, aluminium works, oil refineries and machine factories. Therefore, besides being the Soviet Union's main agricultural area, the steppes are also one of the country's largest industrial areas.

The Caucasus Region

The Caucasus mountains stretch in between the Black Sea and the Caspian Sea. This region differs climatically from the rest of the Soviet Union. It has warmer winters and a large percentage of winter rain. Several kinds of fruits, wheat, sugar-beet, tobacco, silk and cotton are grown in this region and tea is grown on the hill-slopes.

This region is the largest producer of oil in the Soviet Union. Look at the the location of Baku city in Figure 31. Baku on the Caspian Sea, is one of the most important oil-yielding centres in the world. The oil is carried westwards by pipe-line to ports on the Black Sea, from where it is exported to other countries.

Desert Region

The desert region extends from the Caspian Sea, eastward and southward to the bordering mountains. This area receives very little rainfall. The westerly winds which blow across the Soviet Union lose most of their moisture by the time they reach this area. As a result, only scattered shrubs and clumps of grass grow in the dry ground. Most of the land is bare. Only a few sheep herders use the desert for pasture.

However, some of the most fertile land in the Soviet Union is also found in this region. This fertile land is along the foot of the mountains located in the south-eastern edge of the region. The Soviet people have learned to use the water which flows from the nearby mountains to irrigate this land. Plenty of water to irrigate the land and a long, hot growing season make it possible for them to grow cotton, sugar-beet, vegetables and some grain. In addition, fruit orchards are found in the nearby mountain valleys.

In the last thirty years, the Soviet Government has made many changes in the area. Irrigation water is now available and other new farming methods have been introduced. Cotton mills have been built. Aircraft and machine factories have been built by the government. The population in the area has increased because land that was once bare has been made to produce enough for more people. Taskhent is a famous city of this region.

Questions to answer

1 *What are the things which help in changing the way people live ?*

2 *Where do most people in industrial countries live ?*

3 *In which two continents does the Soviet Union stretch and which mountains form the natural border between these continents ?*

4 *Why is the Tundra Region of the Soviet Union very cold ?*

5 *Why is the Western part of the U. S. S. R. the most densely populated area ?*

6 *With the help of the map in Figure* 30 *write the names of at least five stations which lie on the Trans Siberian Railway route.*

Things to do

Collect pictures of the Soviet industries and space travel fr newspapers, periodicals and magazines and prepare a class album.

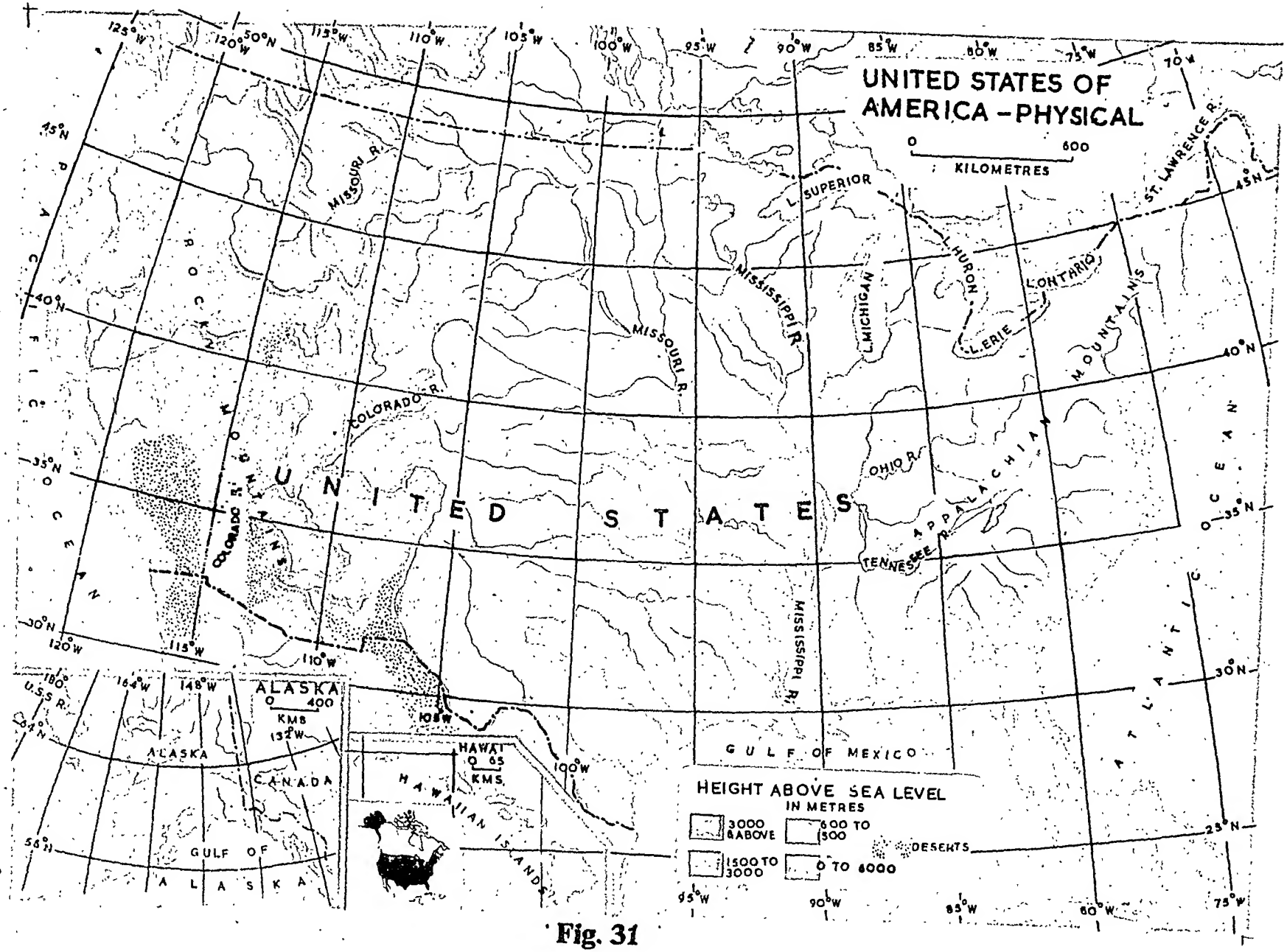

UNITED STATES OF AMERICA – PHYSICAL
0 600
KILOMETRES
UNITED STATES
ROCKY MOUNTAINS
APPALACHIAN MOUNTAINS
MISSOURI R.
MISSISSIPPI R.
COLORADO R.
OHIO R.
TENNESSEE R.
ST. LAWRENCE R.
L. SUPERIOR
L. MICHIGAN
L. HURON
L. ONTARIO
L. ERIE
GULF OF MEXICO
ATLANTIC OCEAN
PACIFIC OCEAN
ALASKA
0 400
KMS
HAWAII
0 65
KMS.
HAWAIIAN ISLANDS
GULF OF ALASKA
CANADA
U.S.S.R.
HEIGHT ABOVE SEA LEVEL
IN METRES
3000 & ABOVE
1500 TO 3000
600 TO 1500
0 TO 600
DESERTS

Fig. 31

16 The United States of America

Size of the United States

The United States of America is popularly known by its smaller name as the United States or the U. S. A. It is now the leading manufacturing nation of the world. Its factories produce a large number of products.

Figure 31 is a map of the United States of America. Note the location of the United States on this map. Between what parallels and what meridians does this country stretch? Most of the land area of the United States lies between 25°N and about 50°N parallels, and between 70°W and 125°W meridians. Locate the United States on the world map in Figure 12. In which direction is it in relation to India ? What country lies to the north of the United States ?

The area of the United States is so big that about three countries of the size of India could fit within its borders. The United States of America is divided into fifty states. The borders of two of these states do not touch the borders of any other states. These states are Alaska and Hawaii. Look at the small inset map of North America in Figure 31 Notice that there are two small black areas not connected to the large black area. The black area in the upper part of the inset map is the state of Alaska. Most of this state is between 60°N and 70°N parallels. The other small black area is the state of Hawaii, a series of small islands located in the Pacific Ocean between the 15°N and 30°N parallels. These islands are represented on the inset map only by small black dots, but over six lakhs of people live on them.

The borders of the other forty-eight states of this nation extend from the Atlantic to the Pacific Ocean. Use the scale given on the map in Figure 31 and measure the distance between the easternmost and the westernmost borders of these states. It is over eight thousand kilometres. The distance from their southernmost to their northernmost borders is over three thousand kilometres.

Land Surface and Climate of the U.S.A.

This vast area has a variety of land surface. Mountains, plateaus, plains, deserts, etc., are all found here. Look at Figure 31 and find answers to

POPULATION OF INDIA AND THE U.S.A.

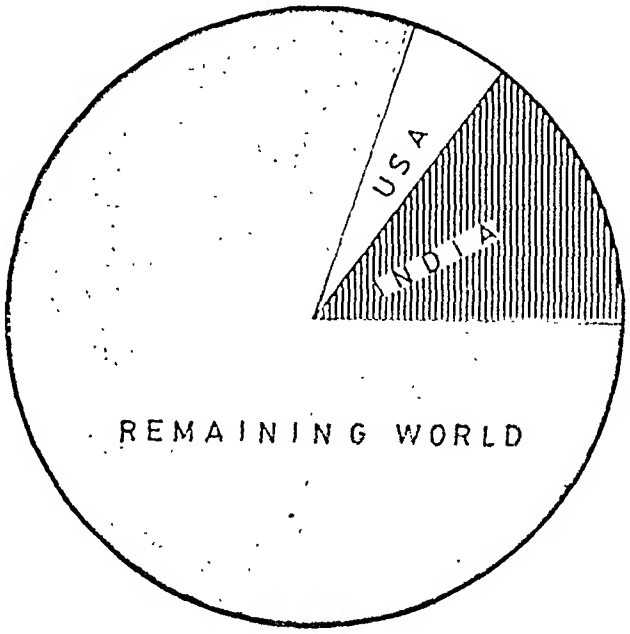


Fig. 32

the following questions. In what part of the United States are most of the mountains located ? What name is given to the largest mountain range in the United States? In what part of the country are the flat low lands located ? Which great river flows in the plains ? Which mountain is east of the plains ? In what part of the country do you find large lakes ? What are their names ? In what part of the country do you find deserts ? Which river flows in the desert area ?

The climate of the United States is not the same everywhere. Summer temperatures in parts of the south-western area of the United States are much like the summer temperatures of Delhi. If you look closely at Figure 31, you will find that parts of the same area have deserts. The climate in the north-central area is quite different. Very often this area has winter temperatures which reach twenty degrees below zero centigrade. The central part receives less rainfall. Some parts of the western coast receive most of the rain in winter and the eastern areas get most of the rain in summer.

People of the United States

More than twenty two crores of people now live in the United States of America. Figure 32 will help you to compare this number with the number of people in India. Note that the part of the circle which represents India's population is more than 3 times the size of the part which represents the population of the United States.

Three hundred years ago very few people lived on the land that is now the United States. Most of these people were in the thirteen American colonies, along the eastern sea coast, living under the rule of the British Government.

Most of the people living in the American colonies were English. But some had come from other European countries, and some were Negroes brought from Africa to work as slaves on large sugar and cotton farms. Some of the people who were from

Britain had left their country in search of riches. Others left because, at that time, all the people of Great Britain were forced to attend the Church of England. They were not allowed to hold their own beliefs about God and to worship Him in their own way.

Although the American colonies were controlled by the British Government, the people there were allowed to worship God in any way they pleased. However, the British Government tried to enforce other laws which the people did not like. In 1776, the people of the American colonies issued what is known as the Declaration of Independence. This Declaration explains why the people thought the colonies should be an independent nation. This marked the beginning of the United States of America. The American colonists fought a war with Britain to gain their independence.

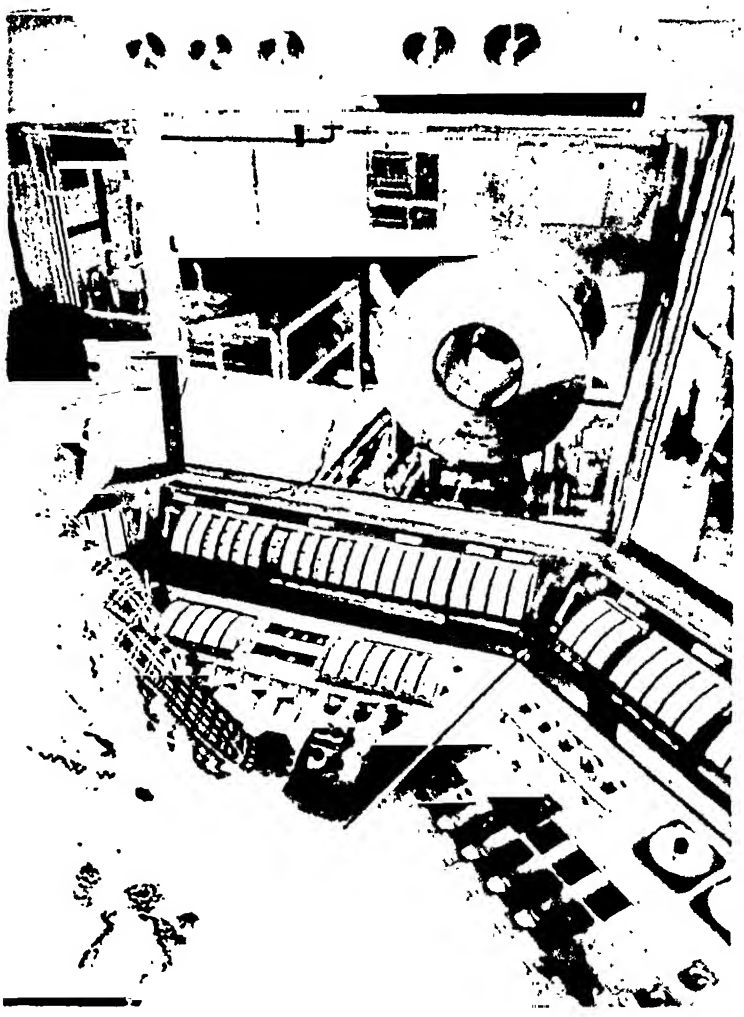
The Declaration of Independence is known all over the world because it contains many exciting ideas like our Indian Constitution. It states that all men are born free, and with equal rights. It says that the government of a nation belongs to its people. And it further states that if people are not satisfied with what the government does they have a right to change it.

Today these ideas are not new, but they were new in 1776. They were ideas which later led people from other countries to move to the United States. During the past one hundred fifty years, more than three crores of people from other countries have settled in the United States. Most of them were from European countries. However, some were from such distant lands as China. People went to the United States for different reasons. Some went because of the stories they heard about the amount of money one could earn. Others went because they were free to worship God and express their beliefs about anything.

The people from different countries who settled in the United States had different ways of doing things. They wore different kinds of clothes and ate different foods. They had different beliefs about God and they spoke different languages. At times, those who had just arrived in the United States had difficulty of living in a strange new country. But their children went to school with other American children, and soon the people from different countries were much alike.

Education in the United States

Soon after the United States became a nation, the people began to give attention to schools. 'In a democracy, where every citizen has equal rights, education is very important', American leaders said. Today there are laws



Man in this picture with the help of his automatic machine supervises and controls several other machines.

that require children in the United States to go to school until they are sixteen years old. Most children graduate from high school. Many also go on to college and university, or to higher schools where they learn a skill or trade. In an industrialized country it is hard for an unskilled person to earn a living.

Industries in the United States

Today two out of every three people in the United States live in cities. The large number of people living in cities is one of the signs of the extent to which the country is industrialized. Another sign is the small number of workers who earn their living on farms. Out of every one hundred workers in the United States, only eight work on farms. Through the use of machinery, fertilizers and modern farming methods, these farm workers produce most of the food needed by the people of United States. In fact, they produce more of several crops than their country needs. As a result, wheat and cotton are among the United States' chief exports.

In the United States most industries are owned by one or more persons called companies and not by the government. These industries produce many, many kinds of products. The main exports are machinery and vehicles. Much of the machinery produced in the United States today is automatic. That is, without much help from workers, the machines do most of the work needed to produce something. Few people are needed to operate these machines. Some of today's machines even tell other machines what to do. Because of such efficient machines, a small number of people can turn out many more products than a large number of workers could a few years ago.

Machines have changed the kind of work done by factory workers.

Workers no longer do much lifting or moving of things. But they do need to know how to operate automatic machinery. They need to use their minds more than their muscles.

Some of today's machines are used in factories that produce automobiles, trucks, railway cars and engines, and airplanes. The transportation industry in the United States is one of the largest in the country. In 1974, it produced over nine lakh automobiles. Actually, the United States has about one automobile for every three persons living in the country.

Figure 33 shows the major types of manufacturing in the United States. It also shows the value of the products produced in each type of industry as compared to other industries. Which type of industry produces products of greatest value ? Which three types of industries produce products of almost the same total value ?

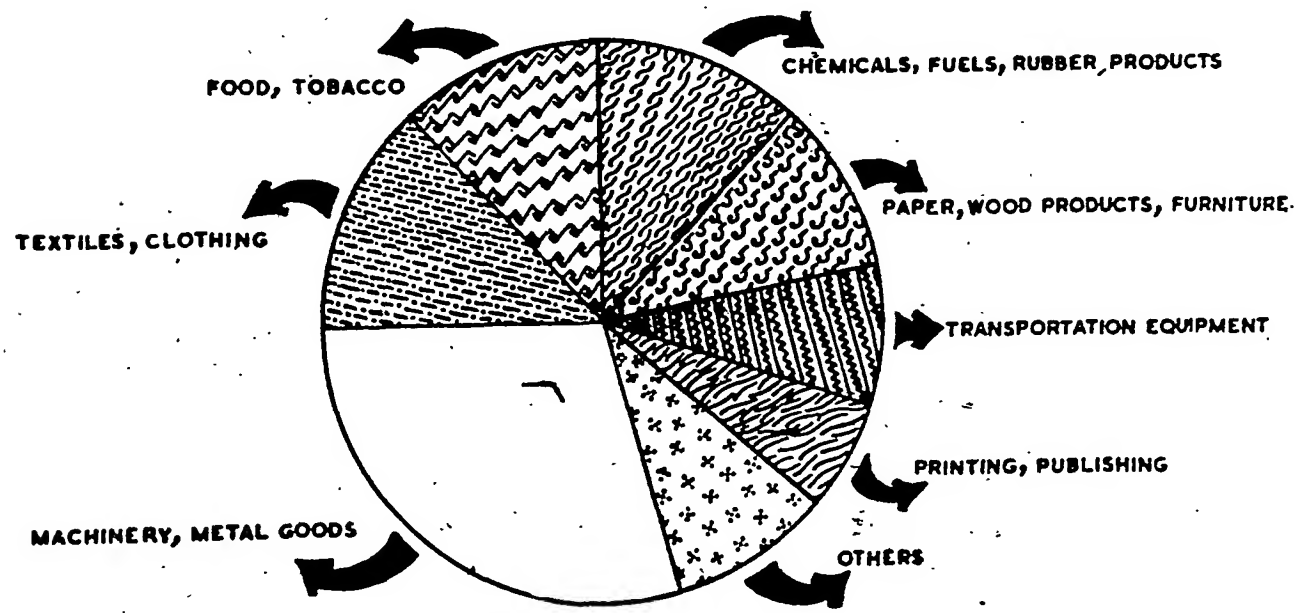
Most of these products are produced in two areas of the United States : in the northern area, from the east coast to the west of about 95° meridian ; and along the west coast. Look at Figure 31 and give at least one reason why most of the industries in the United States are not located between the 100°W and 120°W meridians.

Central Farming Region

Figure 34 is a map of the United States showing the country divided into five regions. The Central Farming Region contains some of the finest farmlands in the world. Here the land is level, the soil is fertile, and

Fig. 33

KINDS OF MANUFACTURING IN THE U.S.A.



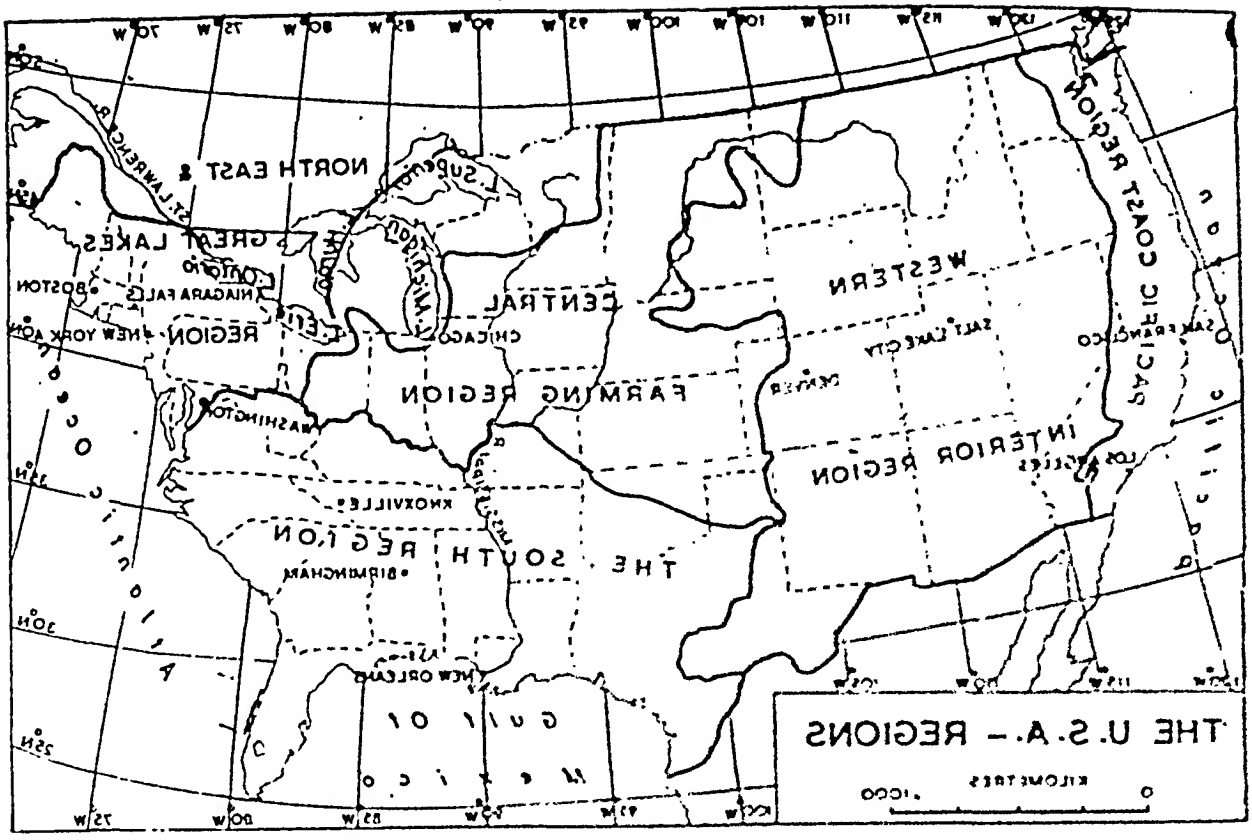


Fig. 34

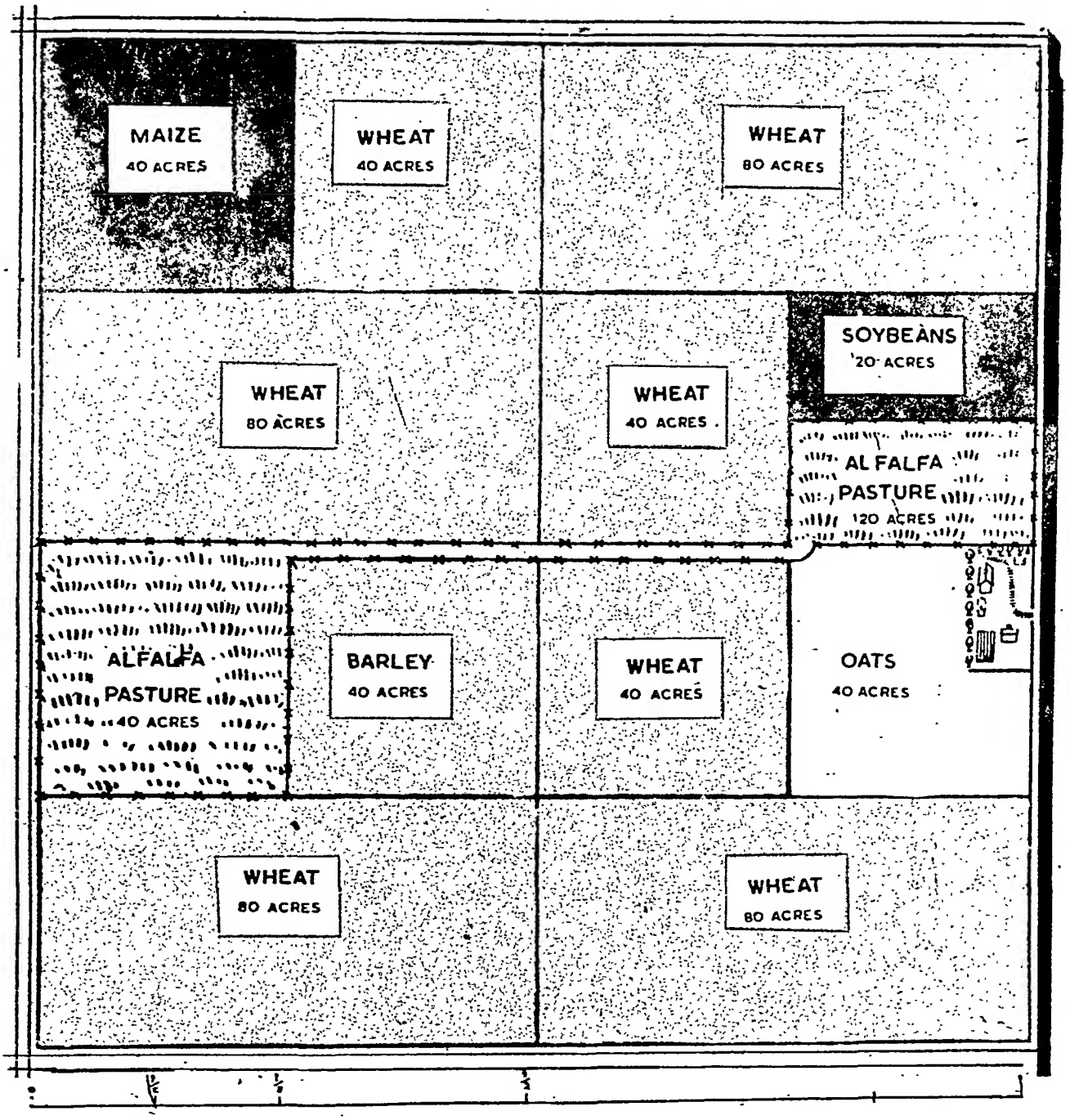
temperature and rainfall make it possible to grow a variety of crops. This is the region that produces the grain and animals, used as food for people of the United States and other countries of the world.

Some of the farms in this area are more than one and one-half kilometres long and one and one-half kilometres wide. These large farms are found in the western part of the region. Wheat is the main crop grown on these farms. Figure 35 is a map which shows the plan of such a farm.

It shows the number of acres occupied by each crop and the area in which the farmer's house and other buildings are located. Note that there are no other farm houses nearby. Often there is a distance of two kilometres or more between two farm houses.

All the work in these large farms is done by the families living in it. During harvest season, the farmer may get some of his neighbours to help him. But much of his work is done with the help of machinery.

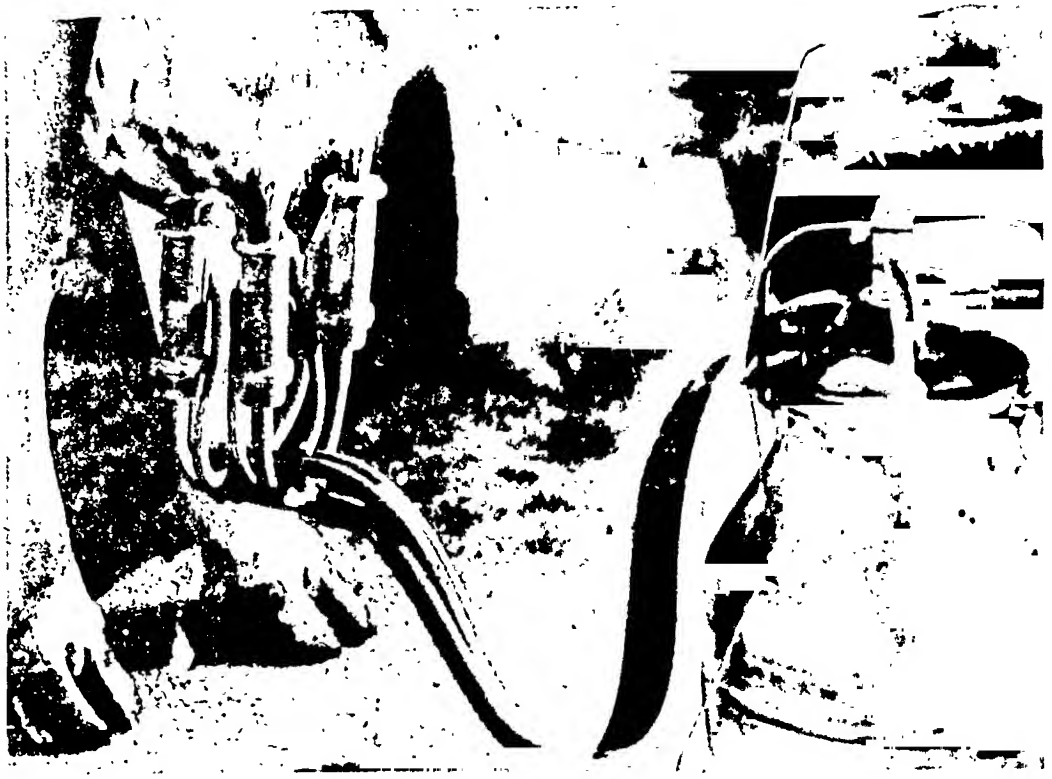
Not all the farms are as large as the one shown in Figure 35. However, only a few are less than one hundred sixty acres. Besides wheat which occupies a large area of the farms, barley, maize, oats, soyabeans and alfalfa are also grown. Also some of the farms are dairy farms. On these farms most of the crops are fed to twenty-five or thirty milk cows. The dairy farmer makes his living by selling milk.



A BIG FARM OF CENTRAL FARMING REGION

640 ACRES

Fig. 35



Milking by machine. Cows in the United States give large quantities of milk. Machines enable the milking process to be easy and clean and also save time.

The Western Interior Region

The Western Interior Region of the United States is probably the most varied in the country. It has some of the highest mountains, yet some parts of the region are lowlands. In the south-western part, the rainfall is so scanty that we find deserts. There, farmlands are irrigated with water from nearby streams or wells, or from reservoirs.

The United States Government has built a number of dams and reservoirs on rivers in the Western Interior Region. From Figure 36 you can fully understand how the land is irrigated and electricity is produced from the waters of reservoirs. As a result much land which was once idle is now used to grow vegetables and fruits. These dams also provide the people living in the area with electricity.

The Western Interior Region is also the centre of a great mining industry. Many years ago, gold and silver were discovered in this region. Today the mines in the region produce copper, lead and zinc ores. Two of the most recently discovered ores are molybdenum and uranium. By using molybdenum with iron ore, a very hard steel can be produced. Uranium is an ore which scientists use to produce atomic energy.

Look at Figure 34 again and compare the size of the Western Interior Region with the other four

regions. Note that it is the largest. Yet. it has fewer people than any other region in the United States. Most of the people living here live in the part where water is plentiful. Many towns in this region are mining towns. They are built around factories which separate the valuable metals from other materials in the ores.

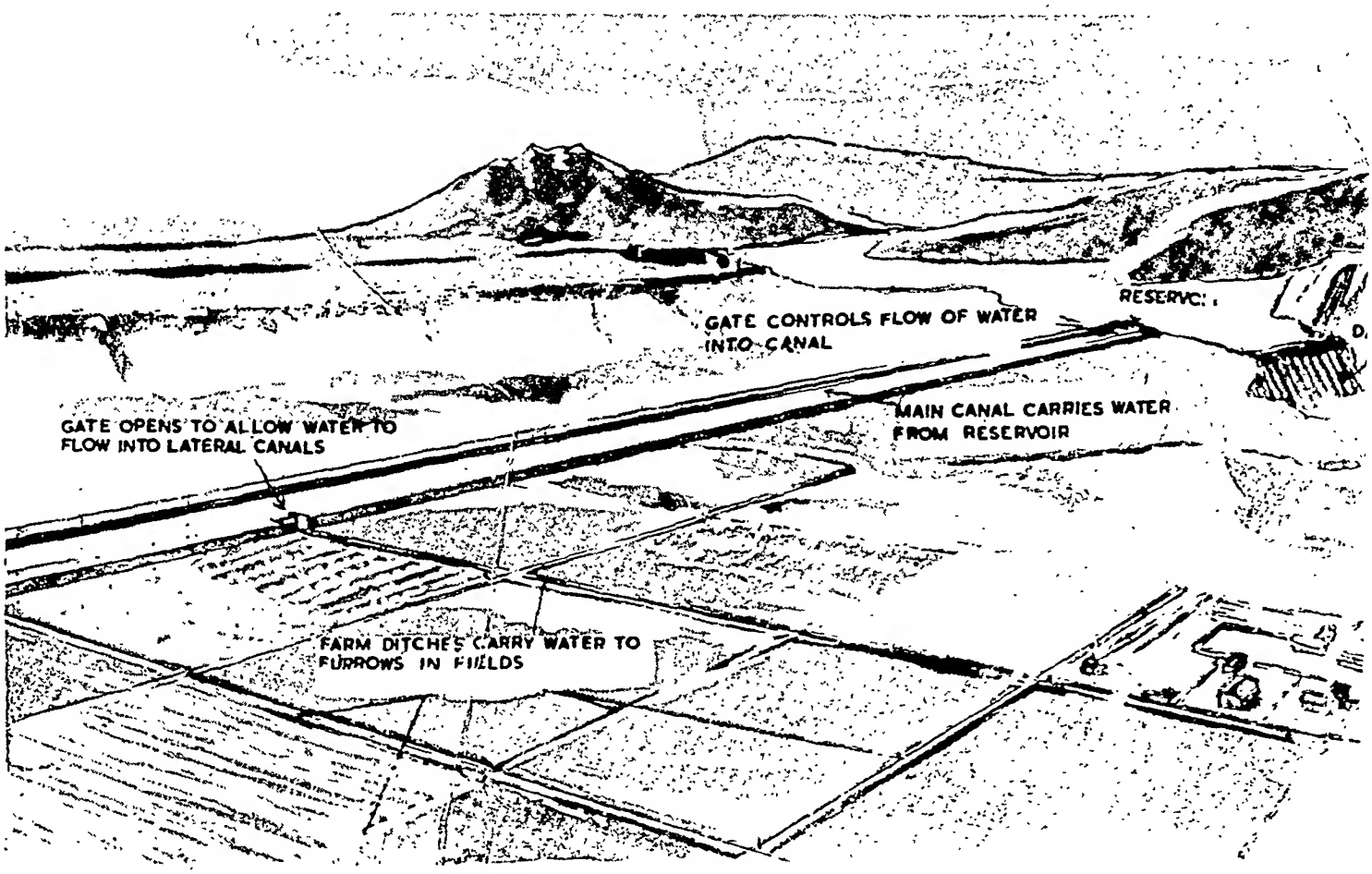
In Figure 34 you can locate the cities of Denver and Salt Lake City. These are two of the largest cities in the Western Interior-Region. They are trading centres for people living in nearby farms and mines. These cities also contain factories which prepare food products and manufacture machinery used in the mines and on the farms.

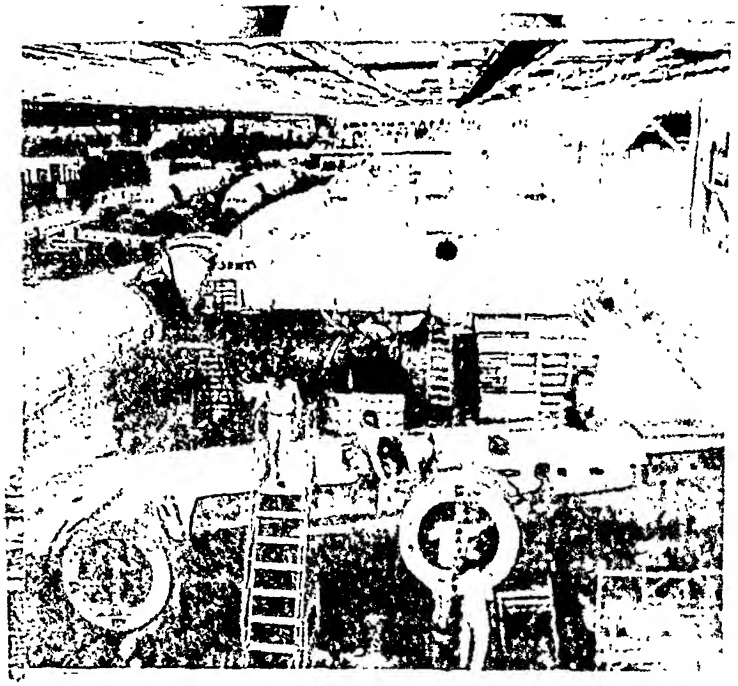
Pacific Coast Region

The Pacific Coast Region is bordered by mountains on the east and the Pacific Ocean on the West. This is one of the fastest developing regions in the United States. That is, more and more people are moving into the region and making it their home. Some are moving into the central or middle part of the region to work in fruit orchards and vineyards (grape farms). Many are moving into

Fig. 36

IRRIGATION IN DRYLANDS





Assembling of different parts of air-planes in an aircraft factory of Los Angeles.

A farmer plucking cotton with his machine in one of the cotton farms of the United States. This machine plucks about 2400 kilograms of cotton every day.

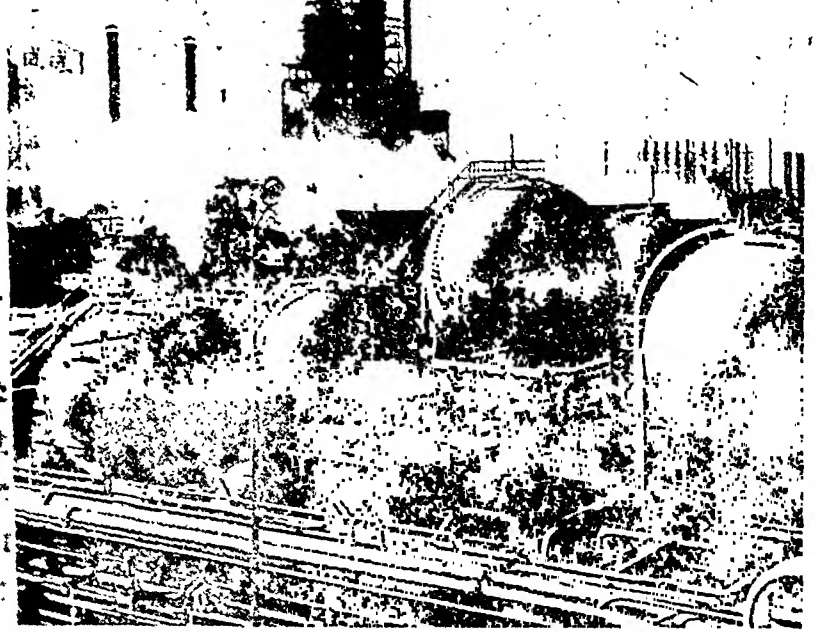
the region to work in new factories and oil refinereries.

Two of the largest cities in the area are Los Angeles and San Francisco. Find them on the map in Figure 34. Many people know about Los Angeles because it is near Hollywood which produces motion pictures. However, today the almost twenty-five lakh people living in Los Angeles work in a variety of industries. One of its most important industries is airplane manufacturing. Airplanes produced in this area are used by many countries of the world.

Both Los Angeles and San Francisco are seaports. Ships from many different nations use the harbours around which these cities are built. Ships from India and other countries in Asia bring silk, jute for burlap bags, hemp for rope, rubber as well as other goods. On their return trip these ships carry tinned and dry fruit, fish, vegetables and manufactured goods.

The Southern Region

Most of the Southern Region of the United States has a warm and humid climate. The summers are long and the winters are mild. Almost everywhere in this region, the rainfall is plentiful for most crops. The climate is one of the reasons why farming is so important in the Southern Region.



The oil tanks in one of the oil refineries of Texas in the United States.

Study Figure 34 closely. You will see a peninsula in the south-eastern corner of the Region. This peninsula lies closer to the equator than most parts of the United States. The climate on this peninsula makes it possible to grow crops all year long. This is why the area leads the country in the production of oranges, grapefruits, lemons and limes—all of which require a long growing season.

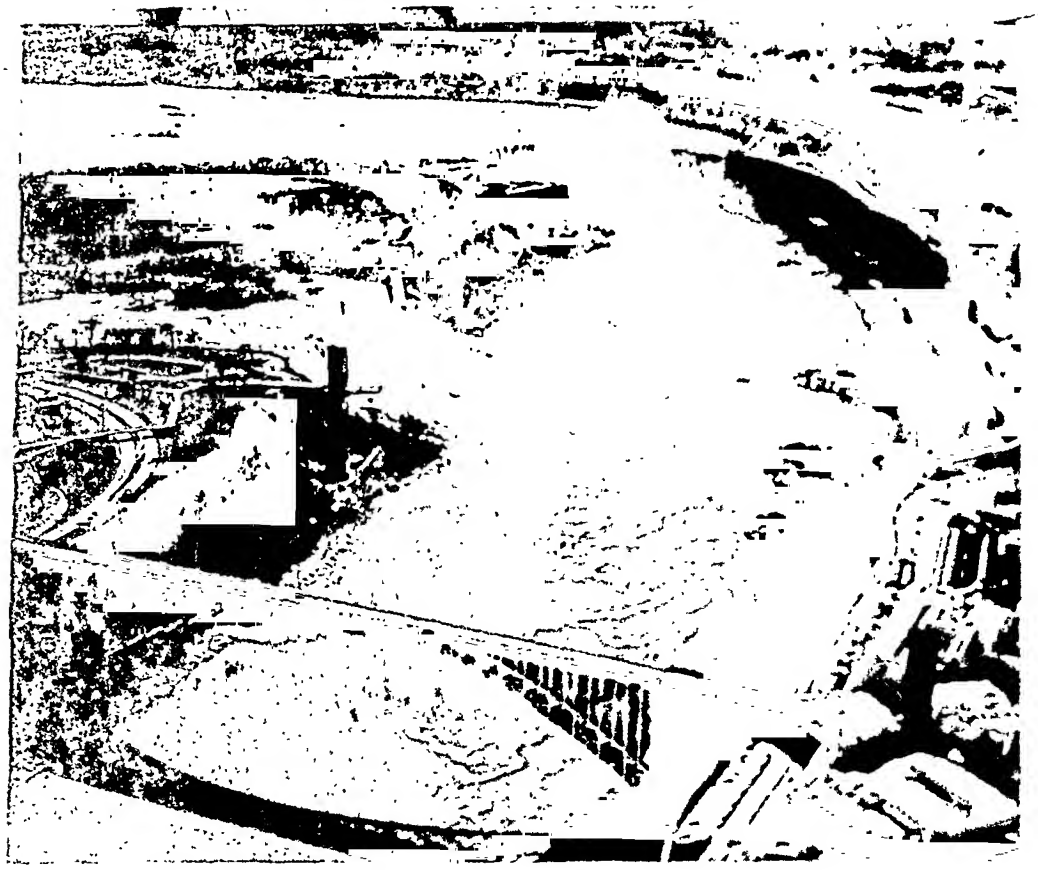
The Southern Region also produces cotton, sugarcane, tobacco and rice. Most of the rice is grown in the delta area formed at the mouth of the Mississippi River. The rice farmers in the Mississippi delta area use large machines to plough, seed and harvest their crops. A few even seed their fields from airplanes.

Although farming is very important in the Southern Region, some people in the area earn their living in other ways. Oil is taken from the ground in the south-western part of the region. Oil wells have even been dug in deep water some kilometres off the coast. As a result, there are large oil refineries which employ many people in the area.

Large amounts of iron ore, coal and limestone are found in the Southern Region. Locate the city of Birmingham in Figure 34. Large steel mills are found in this area because of these minerals.

In Figure 34 you can also find the city of Knoxville in the Southern Region. This is the centre of a very large system of water reservoirs and dams built by the United States Government. Before these dams were built, most of the people in this area were very poor. They made their living on poor farms. Since the building of the dams and water reservoirs, living conditions have improved considerably and the number of people living in the area has increased greatly.

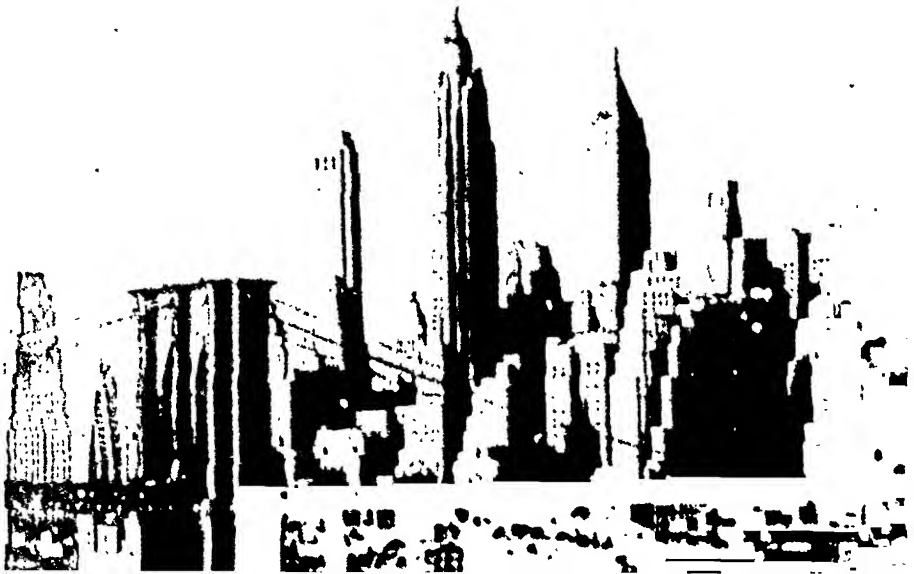
The population increased because the reservoirs provide water for farmlands. The farmers can grow better crops and earn more money. The water in these reservoirs is also used to produce electricity. Now many factories that need cheap electricity are located in the area. These factories attracted a large number of people. They produce aluminium, chemicals and synthetic, or man-made fabrics



The Niagara Falls in the United States and Canada. These falls are a great source of hydro-electric power as well as a great attraction for tourists.

The North-east and Great Lakes Region

Look at the map in Figure 34. Note that the region is located in the north-east part of the country and near the large lake area. The lakes in this region separate the United States and Canada. They are very big and so they are called the Great Lakes. Their water is soft, which is useful for consumption in factories. The depth of water in these lakes is also great, which enables large cargo ships to move in them without any difficulty.



World's tallest buildings or skyscrapers of New York city. Some of these buildings have more than a hundred storeys.

Look at the map in Figure 34 again and read the names of all the Great Lakes. How many are they ? Note that all these lakes are connected with one-another. Between the two eastern lakes is located the world famous Niagara Falls. Tourists from all over the world visit the Niagara Falls in large numbers every year.

The north-east and the Great Lakes Region is a great trade and manufacturing region. Farms, forests and mines are located in the region. Some of the most modern means of transportation can also be found in the region.

Study Figure 34 again and find the St. Lawrence River. Into which ocean does this river flow ? Recent improvements make it possible for large cargo ships to travel on the St. Lawrence. Travelling inland these ships enter the Great Lakes and reach many large cities located on the shores of these lakes. Railroads and roads also criss-cross the North-east and Great Lakes Region.

Manufacturing developed in this region because of the many natural resources such as coal and iron-ore mines in the area and good means of of transportation. However another reason was the number of skilled workers living in the area.

The people of the North-east and Great Lakes Region live in some of the largest cities in the United States. A few of these cities are given in Figure 34. Find the cities of Washington, New York and Boston. Washington is the capital city of the United States. It is very beautiful. The city is famous for its very large parks, historical buildings and government offices.

The city of New-York is famous for the tallest buildings in the world. These buildings are known as '*skyscrapers*'. New York with over seven million people is the world's third largest city. (Which is the first largest city of the world ?) New York is also the largest city and seaport of the United States.. The city of Boston located further north is also a large seaport.

On the south-western shores of Lake Michigan is the city of Chicago. Less than one hundred years ago, Chicago was a small trading center for farmers who lived nearby. Today it is the second largest city in the United States with a population of about thirty-one lakhs.

Chicago has long been the greatest railroad centre in the country. And now it is also one of the United States' leading manufacturing cities.

The main shopping and business district in Chicago is located near the shores of Lake Michigan. Cargo ships from foreign countries as well as other places located along the Great Lakes use the harbour and docks near the centre of the business district. Large buildings provide space for cinema houses, offices and stores.

Some of the large stores are called department stores. They are like the Super Bazaar of Delhi. These stores have many different sections or departments. Each department sells only one kind of goods. People buy everything from food products to building tools in these department stores.

Buses and an underground tube system of transportation make it easy to reach any part of the city. The city extends about fifteen kilometres in all directions from the shores of Lake Michigan. However some people live in apartments located less than a kilometre from the heart of the main business district. Most of these apartments are in tall buildings, some as many as thirty or forty storeys high.

You will find smaller apartment buildings about four or five kilometres from the centre of the business district. These have been built by the government. However, many people in Chicago own their own houses or apartments.

This is a picture of an express highway near Chicago. Every morning express highways like this one are crowded with motor cars or automobiles carrying people to their work.

Many people who work in Chicago live in small communities beyond the city's borders. Some live as much as sixty or seventy kilometres away from the city. These people want to live in a place where there is less noise and people. They want to live in a house of their own, surrounded by lawns or gardens. They travel to the city by train or automobile.

Chicago is ringed with express highways. These are wide roads, some wide enough for six or eight motor-cars to travel along side by side. They are called **express highways** because automobiles can travel at fast speeds on these roads. This makes it possible for people to reach the city quickly.

Between 7 a.m. and 9 a.m. five days during the week, the express highways are filled with motor cars carrying people to work to the city. Between 5 p.m. and 7 p.m. the roads are filled with cars moving away from the city, back to the surrounding communities.

People go to Chicago for other reasons besides work. The city has many museums, theatres, schools and art centres. A huge park is situated along the shores of the lake. Boating, free concerts, and other kinds of entertainment bring many people to this park in the evenings and on holidays.

Questions to answer

1 *What are the good points given in the Declaration of Independence of the United States ?*

2 *Why do most people of the United States live in cities ?*

3 *What are the two agricultural commodities of the United States which are largely exported ?*

4 *What are the advantages of automatic machines ?*

5 *Which industry of the United States is very highly developed ?*

6 *Why is the central farming region suitable for agriculture ?*

7 *Study Figures 32 and 35 and fill up the blanks in the following sentences :*

(*a*) ..... *river flows into the Atlantic Ocean.*

(*b*) *The city of* ..... *is on the south-western shores of the lake*.....

(c) *New Orleons is on the delta of the river .....*

(d) *The city of ..... is located on the Pacific coast of the United States and very near to this city is ..... where motion pictures are produced.*

(e) *The name of the Western Mountain Range of the United States is.....*

(f) *..... is the capital city of the United States.*

Things to do

1 *Prepare a list of all the towns, lakes, rivers and mountains shown on the maps in Figures 3.0 and 33.*

2 *Collect pictures from newspapers, periodicals, magazines etc. about space travel and industries of the United States and prepare a class album from these pictures.*

THE UNITED NATIONS

This book has presented four main ideas. They are as follows :

1 The place where people live on earth often affects the way they live.

2 The peoples of the world are alike in many ways.

3 People follow many different ways of life.

4 New and better means of transportation and communication bring people closer together.

All of these ideas are important. They help us understand the problems countries have in working together. They also help us understand why different countries must work together.

The chapters in this Unit are about an organization formed to help countries work together. It describes the work of the United Nations. It also describes India's part in the United Nations. The information presented should help you to decide whether people from different countries of the world can really live together.

17 What the United Nations Does

People from different countries are closer together today than ever before. On the other hand, there are times when they find it difficult to work together. In many ways the peoples of the world are still a divided, separated people. There are a number of reasons why this is so.

Things that Divide People

One reason is the difference in the languages people speak. There are almost three thousand languages used by the peoples of the world. Each is different from the other . Many are so different that people cannot communicate with each other. This keeps them away from learning about others. It also keeps them away from understanding others. In other words, differences in languages keep people apart.

Another reason the people of the world are kept apart is the differences in their religions. People have many different beliefs about God. They have many different beliefs about the way God should be worshipped. People even have different beliefs about the way a person should behave to please God. And often each thinks his ideas about God are best. This makes it difficult for people to work together. In the past, these beliefs have even been the reason why people fought one another.

A third reason why the peoples of the world are divided is the differences in the amount of wealth they possess. Some countries are considered rich. Food is plentiful in these countries. The peoples of these countries generally own many things which makes life easier for them. Many of them own automobiles. Most people in rich countries own radios and television sets. And many people in these countries own machines which help them with their work in fields, factories, mines and homes.

People in poor countries are not as fortunate. Goods are less plentiful for them. Health conditions are poorer. Doctors say that the lives of as many as three crores of people could be saved each year if health conditions in poor countries improved. Such great differences in wealth make it difficult for people to work together.

Change is Possible

Much can be done to remove the things which keep people apart.

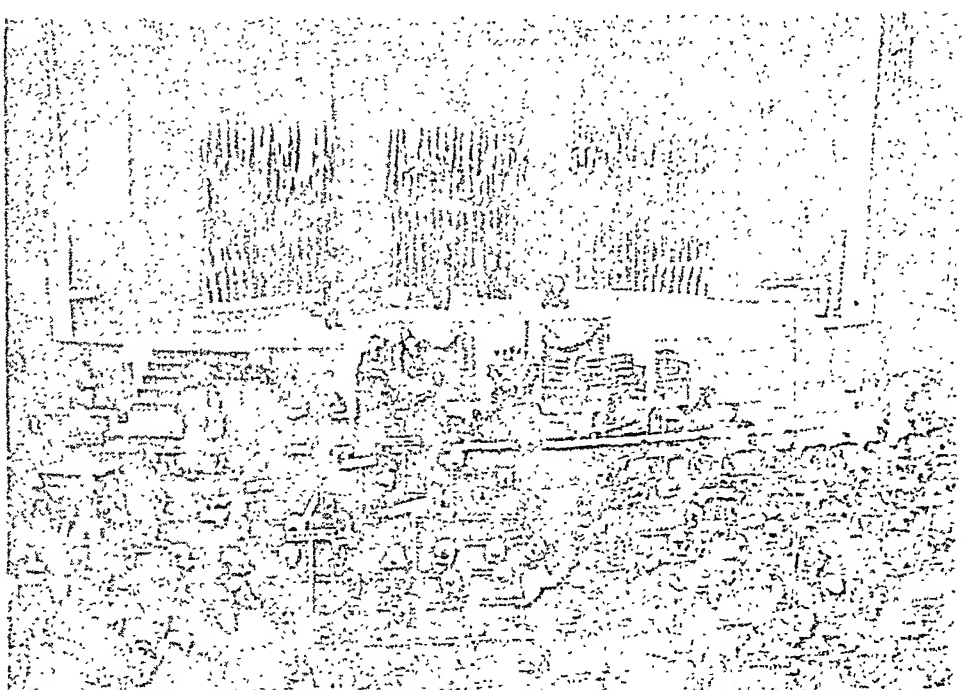
Differences need not be the reason which divides people. In fact differences can be the reason why people come closer together. When people who differ communicate with each other there is a chance for each to learn from the other. Differences need not be feared. They should be encouraged. They can be the beginning of new understandings.

Those who live in poorer countries can become more prosperous. They can learn to use their resources wisely. With assistance from others they can discover new resources. People from poorer countries can give more of their effort and time to things that they can do well. Through education they can strengthen their abilities to do these things. Eventually other peoples of the world would depend upon them for the work they are able to specialize in.

Beginning of the United Nations

In April 1945, a group of people from fifty different countries met in the city of San Francisco in the United States of America. People representing the Indian Government were a part of this group. Everyone in the world was interested in what this group would do. They were interested because this group had come together to form a new organization. It was to be an organization of nations. It was to be an organization of people who were different.

These people spoke different languages. They held many different beliefs about God. Many had different kinds of governments in their countries. And some came from poor nations while others came from rich nations. Yet they had decided to form an organization which would help them work together.



This is a picture of the meeting of representatives of the fifty nations who signed the United Nations Charter.

Here the Indian representative Shri A. Ramaswami Mudaliar is signing the United Nations Charter. The Charter was signed on June 26, 1945.

The people who came together in 1945 had decided that this organization would make the world free of war. The organization they formed would be held together by brotherhood. That is, the nations that belonged to the organization would work together as brothers. And they would work to improve the life of people all over the world.

At the time the group met, most of the nations of the world were at war. They had been at war for more than five years. During that period of time, thousands and thousands of people had been killed. No one really knows the exact number. This war is known as World War II. It was the second time in less than thirty years that many nations of the world were at war. No wonder everyone in the world was interested in the work of this group !

The group met for thirty-three days. Over four hundred meetings were held. It took that many days for the representatives to agree on the kind of organization that should be formed. Many different ideas were discussed. On June 26, 1945 an agreement was reached. The representatives signed the Charter of a new organization, called the United Nations.

United Nations Charter

A charter describes what an organization can and proposes to do. It states what an organization's aims or purposes are. The nations who signed

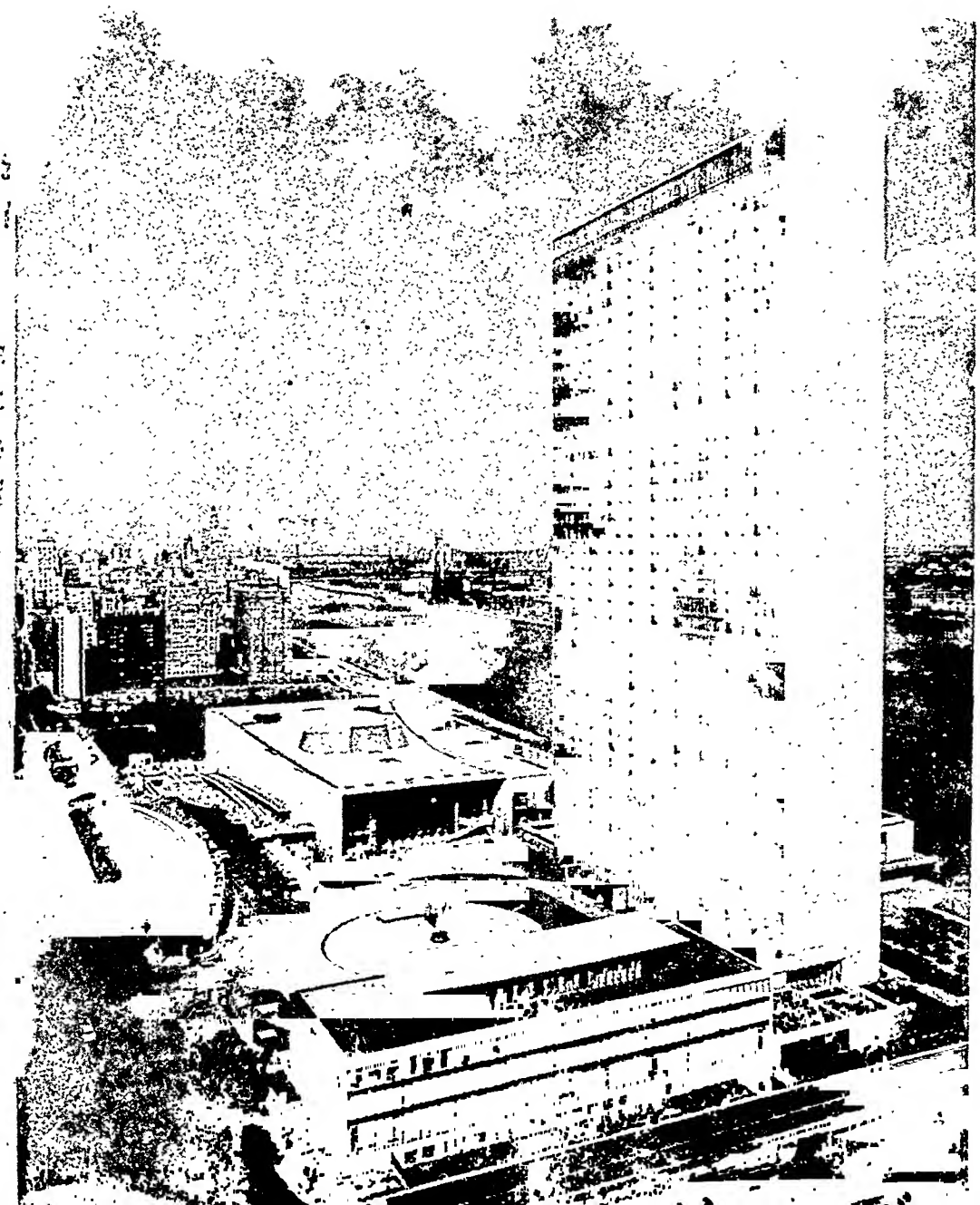
the United Nations Charter agreed to do the following things :

1 To join with other nations and put down any attacks or invasions and to settle disagreements peacefully.

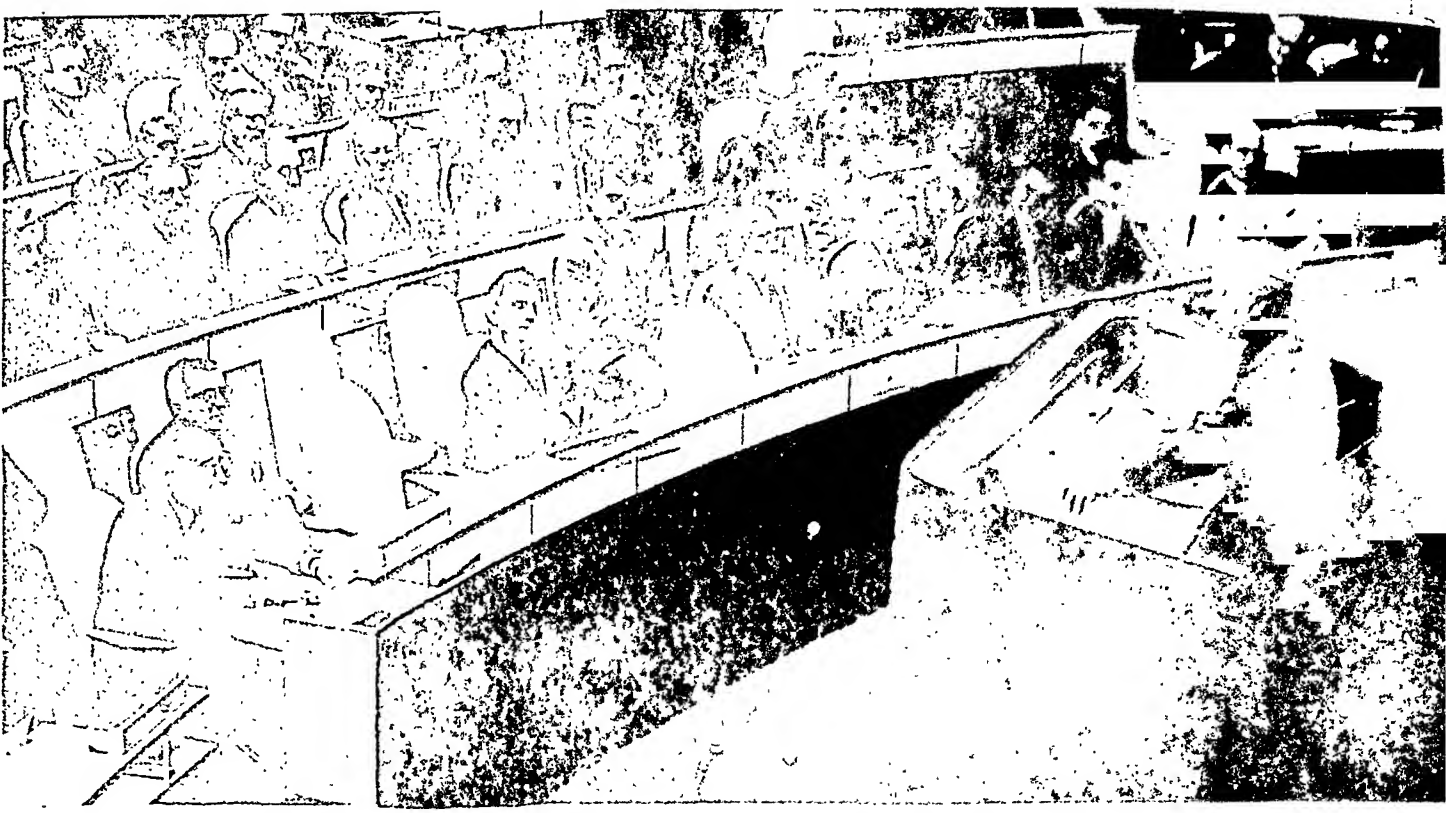
2 To bring about friendly relations among nations, with equal rights for all.

3 To work with other nations in helping all the people of world, supporting the rights and freedoms of all people, no matter what their race, sex, language or religion.

4 To provide a meeting place where all nations can work together to do the things stated above.



The U.N. headquarters, New York city, U.S.A. In the picture on the right is a thirty-nine storey high secretariat building. The front portion of the building houses the U.N. Library and at the back is the hall of the General Assembly.

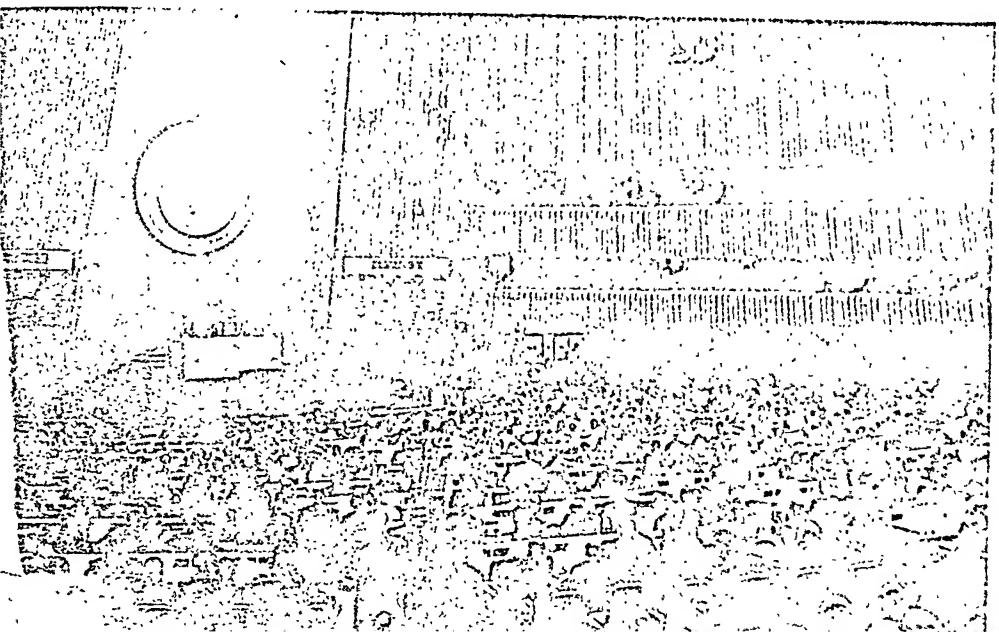


The first Prime Minister of our country, the late Jawaharlal Nehru is addressing the U.N. General Assembly.

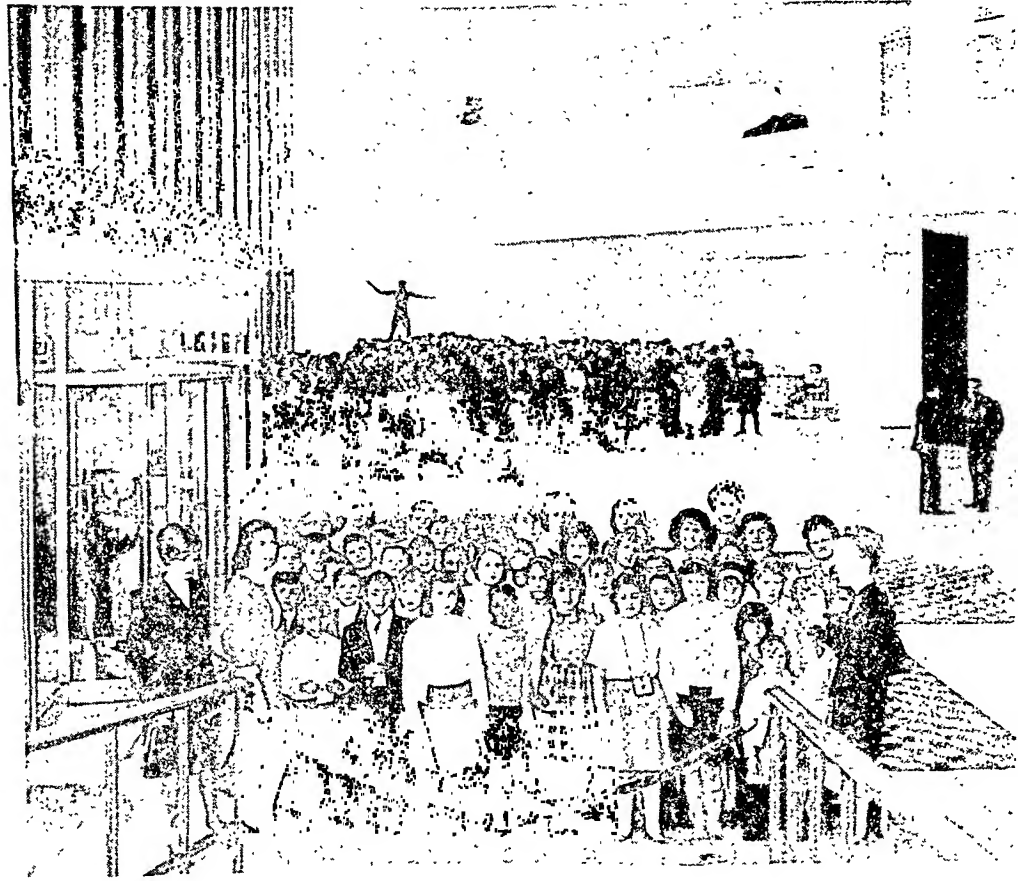
After the Charter was signed, the representatives returned to their countries. They had to get their governments official approval of the Charter. By October 24, 1945 more than one-half of the nations that took part in the April meeting had officially approved the United Nations Charter. Today more than one hundred and fifty nations are members of the United Nations. Each year, in these nations,. October 24 is celebrated as United Nations Day.

Organization of the United Nations

The main or central part of the United Nations is called the General



This is an inside view of the U.N. General Assembly meeting. On the wall behind the dais is the emblem of the United Nations and on the two side-boards are written the names of the member nations.



These school children are visiting the United Nations headquarters. People in large numbers from all over the world visit the U.N. headquarters. They are not only shown the U.N. buildings but also told about the aims and objectives and the various activities of the United Nations.

Assembly. All member nations of the United Nations have representatives in the General Assembly. The General Assembly meets for several months each year. If there is need, representatives of the member nations can be called for a special meeting.

Many world questions and problems are discussed by the General Assembly. Often a vote is taken. This makes it possible to find out what each nation thinks about the question being discussed. When a vote is taken, the size of a nation, its population or its wealth does not matter. Each nation has only one vote.

The General Assembly meets in the largest meeting room at United Nations headquarters in New York City, U. S. A. This room was specially made for meetings of people who speak different languages. Any speech made in this room is immediately repeated in five different languages—Chinese, English, French, Russian and Spanish.

Another important part of the United Nations is called the Security Council. The word 'security' means freedom from danger. A council is a group of people assembled together to discuss things. The United Nations Security Council consists of a group of representatives who discuss problems which endanger the peace of the world.

Five members of the Security Council are permanent members. That is, representatives of these five nations will always be members of the Council. These five nations are France, Peoples Republic of China, the Union of

This Burmese nurse, working for the United Nations is explaining to a family the precautions that should be taken to prevent tuberculosis infection.

Soviet Socialist Republics, the United Kingdom and the United States of America. The other ten members of the Council are elected by the General Assembly. They are elected for a period of two years. The Council makes recommendations to all member nations on how to settle problems between nations. It also decides on how attacks or invasions are to be put down. All the five permanent members of the Security Council must agree before any action is carried out.

There are a number of other divisions of the United Nations Organization. Many of these divisions have special groups to help them do their job. These groups are engaged in many different activities.

They train people for jobs in science and industry. They provide food to people who are in need of assistance. One group helps children throughout the world. This group is known as the United Nations Children's Emergency Fund. When people want to use a shorter name, this group is called UNICEF. UNICEF helps children to get education and special training. It also provides health care for children. The task of the group known as the Food and Agricultural Organization or FAO is to help nations increase their food production. The United Nations World Health Organization or WHO helps fight diseases of all kinds all over the world. The United Nations Educational, Scientific and Cultural Organization or UNESCO helps people of the world in the field of education, the teaching and understanding of science and in the spread of the various cultures of the world.

To help the many groups in the United Nations do their job, a secretariat has been set up. The United Nations Secretariat keeps records, makes studies and handles letters and other forms of communication. The people who do this work come from different

U. Thant, the U.N. Secretary-General, sitting in the centre, is discussing with the late Lal Bahadur Shastri, the second Prime Minister of India and Mr. Swaran Singh, External Affairs Minister, the immediate cessation of hostilities between India and Pakistan during the September, 1965 conflict.

parts of the world. Over one hundred of them are Indians. They are United Nations workers paid by the United Nations.

These workers are under the direction of the Secretary-General. The United Nations Secretary-General is appointed by the member of the General Assembly on the recommendation of the Security Council. The Secretary-General has an important job. With the help of the Secretariat, he carries out the orders of all the groups in United Nations. Sometimes he helps nations to settle disagreements. Sometimes he asks the Security Council to make recommendations when

Soldiers of the U.N. Peace-keeping Force serving on the island of Cypras in the Mediterranean Sea. Here they carry an old man back to his friends and family.

nations disagree. He does this when he thinks the peace of the world is in danger.

Achievements

In 1948, member nations wrote and signed a statement called the Declaration of Human Rights. Many people think this is one of the most important statements made by the United Nations. The Declaration states that people of all nations should have the following rights : to live a full life ; to be free from slavery and danger ; to go to school and be educated ; to obey the same laws that others must obey ; to be free to move about from one place to another ; to worship as they choose ; to have newspapers and magazines and other ways of getting news and information ; to be a citizen of a nation ; to work under favourable conditions ; to receive the same pay as others for the same work ; to marry and have a family.

Even though the United Nations does many kinds of things, people often judge it by the fact whether it is able to maintain peace in the world. The United Nations has helped to keep the peace. There have been times when the United Nations had to send groups of armed men to various places in the world. These men were sent to help keep the peace. Many a times Indian soldiers have been included in these groups.

Few people doubt that the United Nations has helped crores of people all over the world. Many have been saved from disease. Some have been saved from starvation. United Nations members have joined to help the homeless and protect those whose freedom was in danger.

It should be remembered that the United Nations is not a world government. It can not make laws. Its member nations did not give it the right to make laws. The United Nations can only make recommendations. It cannot force nations to do what it thinks must be done. Therefore the United Nations will be successful only so long as the governments of the world are willing to listen to what other people and nations of the world have to say.

Some people say the United Nations is too weak. They say it should have the right and power to force nations to agree with its recommendations. Others say that the United Nations is too strong. These people think the United Nations does things it has not been given the right to do. However, one thing is clear. The United Nations has proved that people of different nations can work together.

Questions to answer

1 *Why did the fifty nations choose to start the United Nations in 1945 ? For example, why didn't they start it ten years earlier ?*

2 *If the United Nations were a world government, India and all other governments in the world could be forced to obey United Nation's decisions. Explain why you think this kind of arrangement is either good or bad.*

3 *Use any part of the book and make a list of things that bring the people of the world together or unite them. Then, make a list of things that divide or keep apart the world's people.*

4 *The four main aims of the United Nations are given on page 149. Some people say that if the United Nations is successful with the aims numbered 2, 3 and 4, it will be much easier to be successful with the aim numbered 1. Explain why they might think this is true.*

5 *If the United Nations Charter was signed by the representatives of all nations on June 26, 1945, why is October 24 celebrated as United Nations Day ?*

6 *Put a tick mark (√) in front of the answers given below which correctly complete the following statement :*
Membership in the U. N. Security Council is

(*a*) *limited to five nations.*

(*b*) *permanent : it does not change.*

(*c*) *both permanent and rotating : that is some nations are permanent and others are elected for a two years period.*

(*d*) *limited at present to fifteen nations.*

Things to do

Prepare a list of all the nations which are the members of the United Nations and also collect their national flags.

18 India and the United Nations

India is an original member of the United Nations. That is, she was one of the nations that helped to organize it. She officially approved the United Nations Charter on October 30, 1945. At that time, India was not an independent nation. She was still under British rule.

There are at least two reasons why India is an original member of the United Nations even though she was not an independent nation when she signed the Charter. Firstly, Indian soldiers were fighting alongside other nations in World War II. India had good reasons to be interested in peace. Secondly, India's leaders have always been trying to find ways to bring peace to the world. Mahatma Gandhi, Jawaharlal Nehru and Lal Bahadur Shastri are known all over the world for their interest in world peace. They are also known for their interest in safeguarding the rights of all people.

India's Beliefs

From the day India became an independent nation she did whatever she could to free people from foreign rule. Her representatives in the United Nations always spoke in favour of freedom for all. They were rewarded in 1960. That year, the General Assembly voted to accept a statement which called for the independence of all people under foreign rule. India did much to get this statement approved by the General Assembly.

India has always spoken for equal treatment of all peoples. That is, she believes all people should be treated alike. For example, the colour of a person's skin should not be the reason that he can or cannot do certain things. Neither should the part of the world he or his family comes from have anything to do with the way others treat him. A person's beliefs about God should not be a reason why he is refused his rights. India has always acted on these beliefs in the United Nations.

India is also known for her belief about the use of the atomic bomb. The atomic bomb is a new kind of explosive. It was made and used for the first time during World War II by the U. S. A. It can be a hundred or a thousand times more destructive than an ordinary bomb. India has always spoken against its use. She refuses to make such a bomb for her own protection even though Indian scientists have the ability to make one. Instead India has urged all nations to

stop producing the atomic bomb. She has spoken against its use and production at many United Nations meetings.

Aid to India

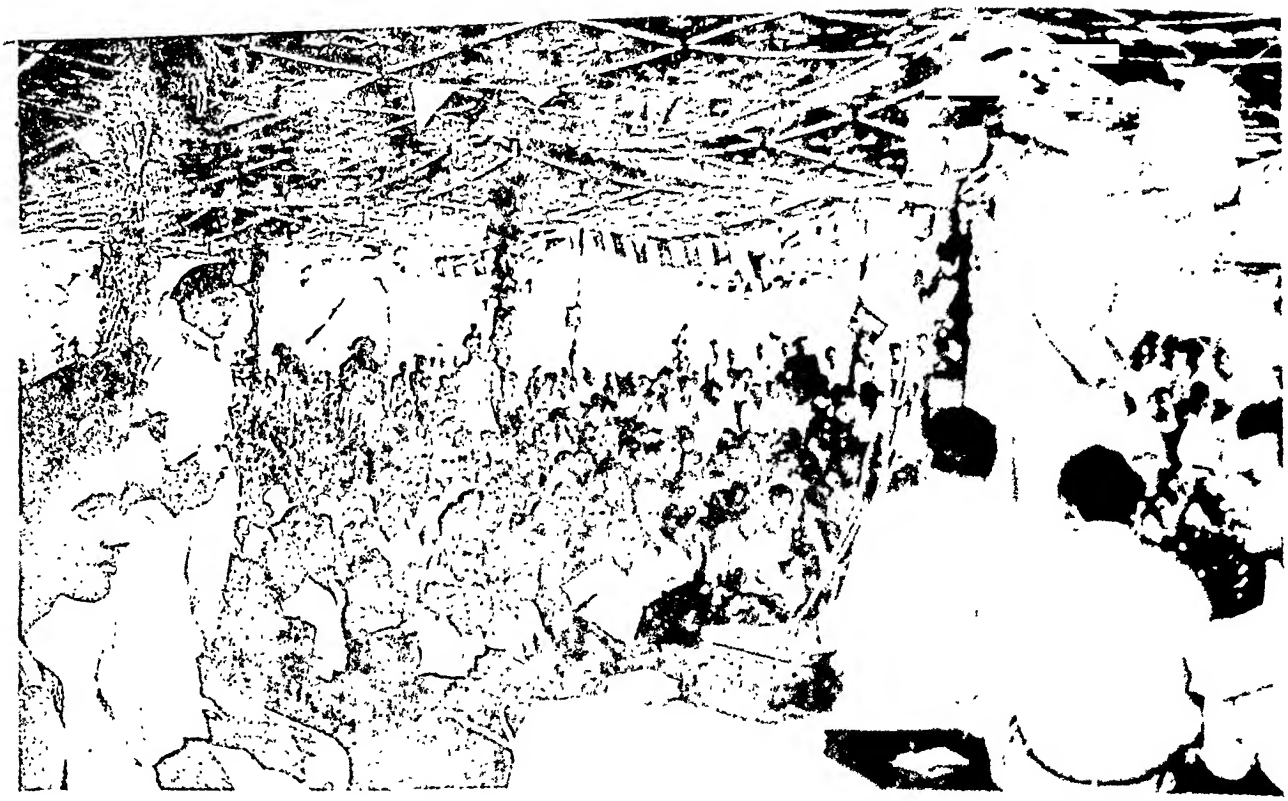
India has been one of the many countries working to help nations produce more goods and crops. She has both given and received aid from United Nations. Most of the aid is called technical aid. That is aid which helps people learn the skills necessary to produce more and better things.

Thus far, the United Nations has given more technical aid to India than any other country. One reason for this is India's large population. She has the largest population among the members of the United Nations. Another reason is India's desire to improve. She is very eager to produce more for her people.

The technical aid given by the United Nations is of three kinds. One kind of aid is sending people for training to member countries of the United Nations. Since 1950 hundreds

Fishery experts of Food and Agriculture Organization of the United Nations are inspecting a fishing net at Cochin.

An expert of the United Nations is explaining points connected with the engine of an automobile to trainees of a technical training school in India



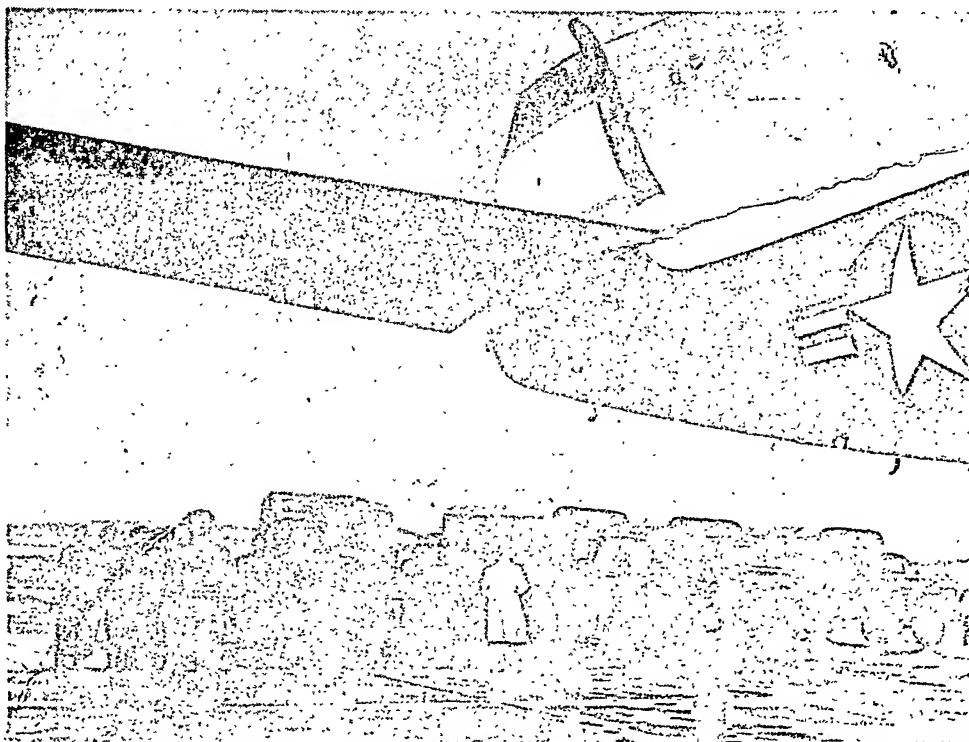
Small-pox eradication campaign programme in India is going on in cooperation with WHO and UNICEF. Here Shri Nuruddin Ahmad, a former mayor of Delhi, is addressing a meeting, organized in connection with the National Small-pox Eradication week on April 7, 1965. The small-pox has now been completely eradicated from India.

Both UNICEF and WHO cooperate in the tuberculosis eradication campaign programme in India. Medicines and medical advice is regularly given to patients by mobile dispensaries

These school girls are taking mid-day meals provided by the schools. The United Nations through its various agencies gives food and milk to many schools in the different nations all over the world.

of Indians have been sent to other countries for training. A second kind of technical aid is providing new equipment.

The third kind of technical aid is sending experts from member nations of the United Nations to other nations who ask for their help. Again,



These Indian soldiers have arrived in Egypt to work for the United Nations Peace-keeping Force.

hundreds of experts of the United Nations have come to work in India since 1950. These experts work in many different places. Some work in government offices. Some work in schools. Some of these experts also work in India's villages. They do all kinds of jobs. Some work as engineers. Others are doctors. Many crores of rupees have been spent on technical aid to India. This has been used to help many of India's schemes.

For example, the United Nations Food and Agricultural Organization (FAO) has helped India improve her fishing industry by finding the best fishing areas. It has also helped to train fishermen in the use of new equipment. The FAO has helped in many other ways. Experts have advised on better use of farm machinery. Some have assisted in milk schemes in various states. Others have worked to improve India's forest industries.

The United Nations World Health Organization (WHO) also helps with many schemes. It helps train nurses and other health workers. It has helped in the fight against such diseases as cholera, malaria and small-pox. At a tuberculosis centre in Madras, WHO experts worked with Indians and found a new way of treating people suffering from tuberculosis.

India's Aid to the United Nations

A complete list of all the aid to India by the United Nations would cover a number of pages. However, the help India has given to other nations through the United Nations is also great. For example, up to 1963 India spent over three crore rupees to help to pay for technical aid. Since 1950 many Indians have been sent to other countries to work as experts. Similarly, the United Nations sent hundreds of persons to India for training.

When the United Nations needed soldiers to keep the peace of the world, India offered them. Indians have been members of United Nations special peace-keeping forces. They have been sent to different places in the world to help keep the peace. Twice an Indian officer has been in charge of these peace-keeping forces.

Like all member nations, India shares the cost of the United Nations. For the year 1964 only, India paid eighty-eight lakh rupees as her share of the money spent by the United Nations. India believes in the United Nations. She believes that the United Nations has made it possible for the people of the world to work together.

Questions to answer

1 *Explain how India became a member of the United Nations even before she was an independent country.*

2 *Describe the three kinds of technical assistance given by the United Nations.*

3 *If one of the aims of the U. N. is to settle disagreements peacefully, why do you think India and other nations have sent soldiers to many parts of the world ?*

4 *What do you think can be done to help more people in our country learn about India's part in the United Nations ?*

5 *Give at least two examples of assistance which India has given to other nations through the United Nations.*

6 *Put a tick mark (✓) in front of each answer which correctly completes the following statement :*
India's belief in equal treatment for all people means that

(*a*) *all people of the world should have the same form of government.*

(*b*) *each government should treat its country's people alike.*

(*c*) *the colour of a man's skin should not be the reason why he can or can not do certain things.*

(*d*) *a person's sex should not be the reason why he or she enjoys certain rights.*

(*e*) *equal treatment of all people must be forced on members of the United Nations.*

Things to do

Collect pictures of some of the activities of the United Nations in India and prepare a class album with these.